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TIGERPAPER
FAO Regional Office for Asia and the Far East
Maliwan Mansion, Phra Atit Road
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EDITORIAL

Man has been killing off animals since the Stone Age and earlier. Waves of extinctions have followed his occupation of new continents or islands around the world. Generally, the large animals and birds that must have made either good hunting and eating or presented a threat to human life, have suffered most. About 70 percent of the large North American mammals became extinct following the invasion of the continent by Stone Age hunters, some 10 000 years ago. Animals in Africa fared better, probably because man emerged in their midst, giving them an opportunity to learn how to avoid the hunter. Even so about 30 percent of the continent's large mammals were lost. Since these early times, there has been a more gradual erosion of species. Few places exist, such as parts of equatorial Africa, Brazil and Central America, where wildlife has been left to thrive in near pristine conditions. In the highly developed countries, where patterns of land use in the countryside remained stable for hundreds of years, many species have learned to live with or avoid man. Intensive agriculture is changing this picture, but the growing pressure of both scientific and popular opinion is helping to limit damage to wildlife as well as to the environment generally. In parts of Germany, F.R. and the United States, for instance, hedges have been replanted where only a few years before these valuable wildlife refuges were being bulldozed away to make bigger, more economic fields.

At present wildlife seems to be at greatest risk in developing countries, often in areas that for a long time have enjoyed a prolonged truce between nature and man. Experience suggests that the most critical time for wildlife is when land-use patterns are subject to rapid change. In these countries, large increases in population, indiscriminate burning of habitats, increased hunting pressure, large-scale tree felling, and introduction of domestic grazing animals all threaten natural resources on a scale never before encountered in the history of mankind. The effect on wildlife can only be surmised, but the few precedents in recent times, the opening up of the United States and the U.S.S.R. give some clues. At the hands of the early European settlers, the American bison declined from an estimated 60 million animals to the point of extinction. Similarly the Russian antelope or saiga was almost exterminated by 1900. Fortunately, these particular species were protected in time to save them. Both countries now consider wildlife conservation to be a priority issue. Through its Wilderness Act of 1964 the United States has set aside over four million hectares of land where, to quote the legislation, "the earth and its community are untrammeled by man, where man himself is a visitor who does not remain... (and) without permanent improvements..." Soviet scientists have built up a population of several million saiga starting from scarcely more than 1 000 animals. They have reintroduced them to former haunts that were unsuitable for cattle grazing and since 1957 the herds have been culled annually, providing over 6 000 tons of first-class meat, not to mention leather, industrial oils and raw material for medicines.

These examples, selected from two of the most powerful industrial states in the world, help to demonstrate why FAO promotes projects to arrest and, if possible, reverse the decline in the world's wild animals and their natural habitats. Wildlife conservation provides opportunities for study, tourism and recreation. The natural ecosystem can also yield appreciable quantities of food and other materials from marginal land of little use for conventional farming.

The recognition of recreational needs and the economic advantages to be derived from tourism has been a major stimulus for the development of, and interest in, national parks. In developing countries whose national productivity is largely a matter of potential, foreign exchange from overseas tourists usually more than justifies the cost of setting up national parks and other recreational areas.

The returns that accrue from introducing tourism or game-cropping, although important, are not the only reason for FAO's interest in wildlife conservation. There are long-term prospects for animal husbandry to be considered. Experiments in the domestication of the eland in Africa have been successful enough to encourage the belief that other wild bovines might in time be added to mankind's domestic animal stock. The banteng, a wild ox, has already been domesticated in Indonesia. Man's few species of meat-producing domestic animals are all members of the order Artiodactyla, which has 192 species in all. It would be a tragedy if such great natural assets, still existing in fair abundance in the world, were to be lost through wanton destruction, indifference or simply failure to understand the needs of animals and their management.

from **Food and Environment,** *FAO 1976.*

BIOLOGICAL EFFECTS OF TERRESTRIAL VERTEBRATES INTRODUCED INTO NON-NATIVE ENVIRONMENTS

by A. de Vos

One of the ways employed by man to drastically modify his environment is through the introduction and transplanting of species, either knowingly or unintentionally. Since the beginning of history, man has moved around plants and animals, but large-scale introductions were tried only recently. In 1953, not less than 21,000 animals were released in the U.S.S.R. Hungary exported on the average yearly 40,000 living hares, 50,000 grey partridges and 35,000 pheasants between 1930 and 1940 (Niethammer, 1963). From 1927-1953 inclusive, 117,000 muskrats were introduced in 500 localities throughout the U.S.S.R. (Hall, 1963). The success of introduced animals can be explained in three ways, although usually many complex factors intervene contemporaneously:

(1) In case of a vacant ecological niche the introduced species will occupy it, become well established and proliferate. It may become a pest.

(2) If the introduced species is more aggressive and successful in competition than a closely related autochthonous species, the latter is usually gradually reduced or eliminated.

(3) The introduction of predatory species threatens the labile predator-prey balance, and modifies this to the detriment of native species (Dorst, 1963). Ecological effects of the introduction of animals include that introduced species can hybridize with related native forms, that they may cause the disappearance of or genetic changes among native species, bring diseases and parasites with them and may do considerable damage to food resources.

Introductions may be classified as intentional or unintentional. Prior to and during the early stages of colonization of many parts of the world, most animals were moved around unintentionally, for example as stowaways on ships. Intentional introductions of animals reached a peak during the nineteenth century.

The majority of introductions of animals have failed. Most of the successful introductions have proved detrimental to man's interests. Introductions usually initiate chain reactions, the consequences of which are completely unpredictable. An exotic species only rarely will occupy the niche which the introducer expects it to fill. By and large it seems impossible to introduce animals under "scientifically controlled" conditions, because of our lack of knowledge of ecological conditions both at home and abroad. There is an obvious need for more detailed research here.

Overly successful introductions usually lead to a demand for control. It is practically impossible or extremely costly to exterminate well established introductions. The only known case of the successful eradication of a mammal is that of the muskrat in England (Warwick, 1934).

The main reason why less success has been obtained with introduced birds than with mammals is their mobility: they generally scatter after release.

In general, the more adaptable an animal is, particularly in food habits, the better are the chances of establishment.

On oceanic islands the lack of competition among indigenous species has favoured the success of introductions.

An analysis of the mechanism of introductions shows that there are internal factors, such as biological adaptability and means of reproduction of the immigrant species, and external factors, including such properties of the environment as its strength to meet competition.

Terminology used

Since there are differences in the national or regional usages of terms, a brief discussion follows in which an effort is made to define these.

An "introduction" I define as an intentional movement of an animal or plant from one continent to another, or from a continent to an island not on a continental shelf.

A "transplantation", meaning literally "to plant in another place", I define as the movement of a species from anywhere in its present range to another place on the same continent or island. A subspecies can be transplanted to the range of a related subspecies, whether the latter is still in existence or not.

The word "acclimatization" means to habituate a species to a new environment which implies adaptation to a new environment. The use of the word usually refers to introduction, but it could also mean transplantation. Because of this ambiguity in use, I suggest that this term be discontinued in the scientific literature. Until recently a distinction was

made between "acclimatization" and "naturalization". The second term meant the successful raising of animals in a new country, similar biologically to their former habitat. This distinction is incorrect, as one cannot find two points on earth with complete identity of natural conditions.

The word "exotic", meaning introduction from abroad, or not native, is generally considered synonymous to "introduction".

The word "feral", meaning untamed, refers to domestic stock or pets which have reverted to the wild state from domestication, either after escape or purposeful release.

An "obligate cultigen" is a cultivated plant of unknown or obscure origin.

Rat

Biological effects of introduced animals

There is evidence accumulating which suggests that among several species of introduced animals, more rapid genetic changes take place than among the parent stock left behind. This is, no doubt, the result of more restricted gene flow.

Among mammals, e.g., the Alpine hare *(Lepus timidus)*, introduced from Norway to the Faroe Islands in 1854-55, has developed into a new subspecies, *L.t. seclusus*, which retains its brown colour the year-round (Bourliere, 1954). A new race of Mouflon *(Ovis musimon)* has developed in Slovakia since about 1910 (Allen, 1954). Fallow deer *(Dama d. dama)*, originally introduced to Europe from Asia Minor, differ considerably from the few remaining representatives of the species in Mesopotamia.

The House mouse *(Mus musculus)* has developed new subspecies in several parts of the world. On the Faroe Islands, e.g., four distinct subspecies exist today (Bourliere, 1954).

In cases of several introduced species of birds, migration behaviour has been disrupted (Canada geese and Mandarin ducks, Niethammer *et al.*, 1963).

Often, introduced species change their food habits in their new environment, or at least, they do damage not known in their native range. In the Caucasus, the Raccoon-dog *(Nyctereutes procyonoides)* reportedly changed its food habits from fish and crabs to game birds, hares and poultry. The introduction of the muskrat *(Ondatra zibethicus)* into Eurasia has resulted in a serious threat to the local economy by damage to dykes, eating fish and damaging nets in freshwater ponds, and raiding field and garden crops (de Vos *et al.*, 1956). The Edible dormouse *(Glis glis)* damages planted trees in the U.K. by eating the bark. (Thompson and Platt, 1964).

There are several known cases of genetic changes to a local form of a species caused by the introduction of another form. Often these changes are detrimental. Effects of crosses of females of the Siberian race of the Roe deer *(Capreolus capreolus pygargus)* with the native race in Czechoslovakia are still perceptible in males with abnormally high and thick antlers. The transplantation of German red deer *(Cervus elaphus)* into Norway has apparently resulted in the virtual extermination of the species there, probably because of German strain is less hardy. Siberian weasels *(Mustela sibirica coreana)* imported to Japan in 1930 have hybridized with the native weasel *(Mustela s. itats)*. The kamchatkan sable *(Martes zibellina kamshadalica)* was introduced into western Siberia, where it has interbred with the native form. Alaskan silver foxes *(Vulpes fulva allascensis)*, released in Finland in 1938, are apparently interbreeding with the native red fox.

Rate of spread of introduced mammals

Unfortunately the rate of spread of introduced species has been inadequately documented.

The most rapid spread recorded for any mammal is that of the muskrat after its introduction in Europe. The spread in Finland was 18-25 miles per year (de Vos *et al.*, 1956). The rate of spread of the Gray squirrel in Britain during the period since it was successfully established has been in the order of about five miles a year (Taylor, 1964).

The spread of ungulates does not appear to be as rapid, with the possible exception of the chamois, whose rate of spread in New Zealand was estimated at 5.4 miles per year. After its introduction into Newfoundland, the Moose spread 2 miles per year. Fallow deer, White-tailed deer, Rusa deer and Sambar deer spread at the rate of 0.5 mile per year, and Sika deer, Thar and Red deer 1 mile per year in New Zealand.

Introduction of diseases and parasites

The consequences of the importation of diseases and parasites with exotics as hosts are not fully appreciated. Most diseases are more dangerous to hosts which have not been previously exposed, since these did not develop immunity. Introduced diseases may easily become established among indigenous species, and it may be impossible to eradicate these

in their new hosts. Epizootic diseases may be particularly destructive after introduction. Examples of such diseases, introduced from one continent to another, include rinderpest, foot-and-mouth disease, and swine fever.

Although natural selection tends to reduce the severity of the effect of the pathogen on the host (as in case of myxomatosis and European rabbits in Australia), in the wild the new host may succumb to the disease before it has been able to built up adequate resistance, or at least it may become rare. In this case the old host, with which the disease was introduced, may take over completely or partially. Various introduced pathogenic agents have been responsible for the rarity of certain endemic birds.

There are few data on introduced parasites and their possible influence on native hosts. Parasites do get introduced, sometimes several species in one host. These parasites can be transferred to closely related or associated species of hosts. Three nematodes and two cestodes were introduced with the European rabbit to New Zealand. At least two parasites, a cestode and a trematode, were introduced with muskrats to Great Britain. The more complicated the life cycle of the introduced parasite, the less likely are the chances of survival.

Little information is available about the introduction of parasites with their respective hosts. It seems likely that the *Trombicula akamushii*, which harbors the rickettsial disease, scrub typhus, has been spread widely with rats and other rodents. The Indian rat flea, *Xenopsylla cheopis*, which transmits bubonic plague, has also been spread widely with rats on ships into many parts of the world.

Damage to man's food sources

Outstanding examples of damage done to human food resources by introduced animals include the European rabbit in Australia and New Zealand, the European hare in Ontario and Argentina, the Brown rat in many parts of the world, and the Gray Squirrel to fruit trees in South Africa.

Other examples include damage done by European starlings and House sparrows in North America, and by the Chinese woolhand crab in Western Europe.

Mongoose

Competition between introduced and indigenous species

The introduction of any species of animal results in competition, particularly with closely related indigenous species. Such competition is difficult to analyze. Some cases have been well documented. These include competition between the American gray squirrel and the Red squirrel *(Sciuros vulgaris)* in England (Middleton, 1930, Shorten 1960), and the European hare *(Lupus e. europaeus)* and the Alpine hare in Sweden. Introduced rats are blamed for the destruction of small insectivores *(Nesophontes)* and native Rice rats and Spring rats on the Caribbean Islands (Westermann, 1953). The European starling has effectively reduced the population of another hole-nesting species, the Bluebird. The Mynah *(Acridotheres tristis)*, originally from Southeast Asia, has been introduced into several other warm countries, from South Africa to Oceania. Wherever it has been introduced, it has contributed to the reduction of native birds by occupying their nests, and chasing ecologically comparable species from their territories (Dorst, 1963).

What are "useful" introductions?

The problems discussed and the principles elucidated in this paper are based on limited data. There is a need for more research on introduced species everywhere in the world.

Introductions offer both advantages and dangers. Many cultivated crops and domesticated livestock species, strictly speaking, are exotic to many areas of the world and yet are essential to human welfare there. Among wild animals, too, such introductions as the moose in Newfoundland can only be viewed as useful. Possibilities for further introduced species exist wherever unoccupied habitats occur, but the greatest care must be taken to import species which not only are capable of biological success but also are certain to be wholly desirable.

We cannot adequately and completely foresee the implications of our actions when we introduce another species. Introductions should be made only when the mentioned limitations are carefully considered. Estimates should be made of the possible side-effects of an introduction. Efforts should be made to make the public aware that unexpected side-effects may occur at any time.

There is considerable need for more research on the biology and ecological requirements of a species that is scheduled for introduction and of the ecological conditions that prevail in the environ-

ment into which the introduction of such a species is planned. But even the most carefully executed research does not eliminate the possibility of changes in the habits of species after introduction, Extreme care must be taken where further introductions are undertaken.

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NEW SOUTH PACIFIC COURSE ON NATIONAL PARKS AND RESERVES ADMINISTRATION

Last year, a new training course in the administration of national parks and reserves was sponsored jointly, under their various aid programmes, by the Australian and New Zealand Governments. Senior public servants from Papua New Guinea, Nepal, Zambia, Cook Islands, Botswana, Seychelles, Thailand, Singapore, Philippines, Peru, Pakistan, Malaysia and Nigeria attended the course. All persons were in a position to recommend policy and motivate its adoption in their own countries.

The course lasted 12 weeks and explored the establishment and management of systems of national parks and reserves through their philosophy, organisation and development. Items covered included:

(a) Environmental and cultural conservation
(b) Establishment of parks and reserves
(c) Organisation and function of administration
(d) Plan implementation (including finance, administrative and organisational aspects)
(e) Tourism in parks, its potential and problem
(f) Conservation and environmental problems in a development situation.

Among other activities, two weeks were spent in Canberra, where academic sessions were held, and one month in New Zealand to study the organisational set-up of national parks and reserves there.

The course also spent a short period in Papua New Guinea, the objective being to show members the problems of a new nation in setting up a parks and reserves system with added complications of a difficult land tenure system to contend with and having to manage on a restricted budget.

The courses/study tour was adjudged a great success by all participants and the Australian and New Zealand Governments seeing the need for a course of this nature have agreed to fund a similar course to start in February 1978. Invitations to Governments to nominate personnel will be sent out during March 1977 with applications closing in late August 1977.

It was disappointing that more countries from the South Pacific region did not take the opportunity to nominate persons for the course in 1976, and it is hoped that news of the success of this course will mean more nominations forthcoming for the 1978 course.

Any enquiries about this course should be made to either the Australian Development Assistance Agency, P.O. Box 887, Canberra City 2601 ACT, Australia or the Ministry of Foreign Affairs, Private Bag, Wellington, New Zealand.

Epiphytes (Asplenium nidus) in Lower montane rain forest.

CONSERVATION OF TROPICAL RAIN FORESTS II

This is the second, and last, article in the set of articles based on T.C. Whitmore's report: Conservation Review of Tropical Rain Forest (1975b). The first article in this series was published in **Tigerpaper** *IV:1 and dealt with general considerations on tropical rain forests. This article will explain the different rain forest formations in Asia and the Pacific. The report has now been superseded by a further one (Whitmore & Grimwood 1976) which IUCN hopes to publish. The new report has been the basis of a plan for conservation action in the region, which appears under* **News from WWF/IUCN.**

The classification described below of formations used for Asia is that of Whitmore (1975a). The definitions are extracted from this source and the original should be consulted for further detail and references. Much of the rest of this section is an abbreviated paraphrase of the source document.

The formations are listed in Table 1 which also groups them into a hierarchy based on soil and measures of water availability. They will be described in only very general terms in the following sections. The principal characters are physiognomic and structural. These two groups of attributes are not always clearly identifiable with important habitats or environments. Therefore supplementary environmental terms are included in the names and occasionally in the definitions where this assists identification. The classification is therefore pragmatic rather than strictly systematic, in order to provide formations with names and characteristics which are meaningful and descriptive (cf. UNESCO, 1973). Extreme examples of this departure from a strictly structural/physiognomic classification are 'peat swamp forest' and 'forests on limestone'. In both these cases several different forests are brought together because of a common distinctive habitat.

1. **Tropical lowland evergreen rain forest.** Key reference: Whitmore (1975a) section 10.1

This is the most luxuriant of all plant communities and occurs under what are probably the finest dry-land growing conditions found anywhere in the world. It is a lofty, dense, evergreen forest 45 m. or more high, only occasionally less, characterized by the large number of trees which occur together. Gregarious dominants (consociations) are uncommon and usually two-thirds or more of the upper-canopy trees are of species individually, not contributing more than 1 percent of the total number. This formation is conventionally regarded as having three tree layers; the top layer of individual or grouped giant emergent trees, over a main stratum at about 24-36 m., and with smaller, shade-dwelling

trees below that. Ground vegetation is often sparse, and mainly of small trees; herbs are uncommon. Big woody climbers, mostly freehanging, are frequent to abundant and sometimes also bole climbers. Shade and sun epiphytes are occasional to frequent. Bryophytes (liverworts and mosses) are rare.

Tropical lowland evergreen rain forest has the greatest number of species of any rain forest formation. It is doubtful if any other vegetation type in the world exceeds it in this respect. All other rain forest formations differ from this in simpler structure, and in some cases in having fewer life-forms.

2./3./4. **Montane forest formations.** Key reference: Whitmore (1975a) chapter 16

As one climbs a tropical mountain one successively encounters forests of different structure, physiognomy and flora. The most dramatic change, partly so because it usually occurs sharply over a short distance, is from mesophyll-dominated forest with an uneven, billowing canopy surface to microphyll-dominated forest with a lower, flattish canopy surface, the trees are more slender, usually with gnarled limbs and very dense subcrowns. This latter formation is called **Upper montane rain forest.**

Upper montane rain forest is frequently only 10 m. tall or less (range 1.5-18 m.), and its shorter facies are sometimes called elfin woodland. On all major mountains there is an intermediate formation, **Lower montane rain forest**, below the upper montane rain forest, which itself merges downwards with lowland rain forest, usually through a broad ecotone.

Lower montane differs from lowland rain forest in having a lower canopy (15-33 m. against 25-45 m.), with fewer, smaller emergent trees. Big woody climbers are usually absent, vascular epiphytes are abundant (as opposed to frequent).

Tropical subalpine forest is approximately 4.5 m. tall. The subalpine forest formation is represented on the bigger mountains of Papua New Guinea, West Irian, Sumatra and Java at the uppermost limits of forest by a forest with low, dense canopy containing a strong microtherm element in the flora but does not apparently occur elsewhere in the Far East.

5. **Heath forest.** Key reference: Whitmore (1975a) section 10.3

On soils derived from siliceous parent materials which are inherently poor in bases, and commonly coarsely textured and freely draining, evergreen rain forest is replaced by (evergreen) heath forest and this is strikingly different in flora, structure, and physiognomy.

"In the forest, the storey formed by large saplings and small poles predominates and forms a tidy and orderly but forbidding phalanx which is dense and often difficult to penetrate. The canopy is low, uniform, and usually densely closed with no trace of layering." (Brunig, writing on the heath forest at Bako National Park, Sarawak).

Big woody climbers (including climbing palms) are rare, but slender, wiry independent climbers frequent. Epiphytes are frequent and photophytes occur nearer the ground than in evergreen rain forest. Myrmecophytes (ant-plants) are abundant, in the more open and stunted heath forests.

6. **Forest over limestone.** Key reference: Whitmore (1975a) section 10.4

In deep soil pockets on ledges and in sink holes most of the few Dipterocarpaceae associated with limestone occur. Limestone slopes have a dense, irregular forest with trees clinging precariously. Sheer cliffs bear scattered shrubs and a characteristic herb flora, amongst which Gesneriaceae are prominent. Recently emerged pericoastal limestone platforms are another limestone habitat, with widespread small occurrences in both Malesia and the Melanesian archipelagos. Various habitats of krast limestone have distinctive floras, and overall limestone vegetation is rich in endemics.

7. **Forest over ultrabasic rocks.** Key reference: Whitmore (1975a) section 10.5

There is much variation in forest structure, physiognomy and floristics over ultrabasic rocks, ranging from forests which are very similar to evergreen rain forest to others which are highly distinctive.

8. **Beach vegetation.** Key reference: Whitmore (1975a) section 10.6

On the beach wall, that is, the low (0.5-1 m.) ridge at the inland margin of the sand beach, the *Barringtonia association*, is found. Seedlings of beach trees, including coconuts from water-borne fruits and of the wind-dispersed *Casuarina equisetifolia* are found on the sea side of the beach wall.

9. **Mangrove forest.** Key reference: Whitmore (1975a) section 11.1

Mangrove forest is well-known, its flora does not change much through the region. It is best developed on muddy, accreting coasts.

10. **Brackish water forest.** Key reference: Whitmore (1975a) section 11.2

The inland edge of the mangrove and the upper tidal limit of estuaries carries a forest with a number of distinctive species amongst which *Nypa fruticans* is important. This palm forms extensive pure stands mainly along water courses.

11. **Peat swamp forest.** Key reference: Whitmore (1975a) section 11.3

The peat swamp forest formation is of a very special type and with a rather restricted flora. Tropical peat is usually acid with a pH usually less than 4.0. The only incoming water is from rain, which is *ipso facto* extremely mineral deficient. The

The main forest formations of the tropical Far East (Whitmore, 1975b). Table 1

CLIMATE	SOIL WATER	LOCALITIES	SOILS	ELEVATION		FOREST FORMATION	
everwet	dry land	inland	zonal soils	lowlands to 1200 m		1 tropical lowland evergreen rain forest	tropical rain forests
				mountains	(750) 1200 - 1500 m	2 tropical lower montane rain forest	
					(600) 1500 to 3000 (3350) m	3 tropical upper montane rain forest	
					3000 (3350) m to tree line	4 tropical subalpine forest	
			podzolised sands	mostly lowlands		5 heath forest	
			limestone	mostly lowlands		6 forest over limestone	
			ultrabasic rocks	mostly lowlands		7 forest over ultrabasic rocks	
		coastal				8 beach vegetation	
	water table high (at least periodically)	salt water				9 mangrove forest	
		brackish water				10 brackish water forest	
		fresh water	oliogtrophic peats			11 peat swamp forest	
			eutrophic (muck and mineral) soils	almost permanently wet		12 a fresh water swamp forest	
				periodically wet		12 b seasonal swamp forest	
seasonally dry	moderate annual shortage					13 tropical semi-evergreen rain forest	
	marked annual shortage					14 tropical moist deciduous forest 15 other formations of increasingly dry seasonal climates	monsoon forests

forests growing on most of the peat swamps in the region have evidence of concentric zones, the innermost one being a forest of stunted trees, commonly of markedly xeromorphic aspect.

12. **Fresh-water and seasonal swamp forest.** Key reference: Whitmore (1975a) section 11.4

The soil surface of land covered by the fresh-water swamp forest formation is regularly to occasionally inundated with fresh-water. The environment, including the soils, is extremely heterogeneous. The floristic composition and the structure of the vegetation vary enormously from floating grass mats and open sedge or grass plains, to pandan or palm swamp and to scrub and forest.

13. **Tropical semi-evergreen rain forest.** Key reference: Whitmore (1975a) section 10.2

Semi-evergreen rain forest is a closed, high rain forest in which the biggest trees sometimes attain large sizes. It includes both evergreen and, in the top of the canopy, deciduous trees, in an intimate mixture but with a definite tendency to gregarious occurrence. Deciduous trees may comprise up to one-third of the taller trees, though not all are necessarily leafless at the same time. The number of species is high but less so than in evergreen rain forest. Big woody climbers tend to be very abundant. Bamboos are present. Epiphytes are occasional to frequent and include many ferns and orchids.

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Cauliflory (Baccaurea griffithii), Malaysia.

CRANES IN KOREA

The Japanese crane *(Grus japonensis)* and White-naped crane *(Grus vipio)* are winter residents of the Republic of Korea, and the Hooded crane *(Grus monacha)* is a rare passage migrant. All three species are included in the International Union for the Conservation of Nature's **Red Data Book** indicating the rare and endangered status of these large Asian birds.

The Japanese crane breeds in the temperate areas of east Asia from eastern Mongolia to Hokkaido, Japan. Soviet scientists report a possible 60 Japanese cranes along the Amur and Bureja River and near Lake Khanka. No information is available from China and the species is reported as exceedingly rare in Mongolia. Approximately 200 cranes survive in southeastern Hokkaido, Japan. The Hokkaido birds are locally migratory from the wetlands on which they breed, to 29 winter feeding stations in the vicinities of Kushiro and Furen cities. The mainland Asia birds are migratory to northeastern China, North Korea, and the Republic of Korea. Chinese zoo personnel trap Japanese cranes each winter, wild cranes mix with captive cranes at the Pyongyang zoo, but numbers of wild cranes that winter in China and North Korea are not known.

Each winter, approximately 35 to 40 Japanese cranes winter in the Republic of Korea. Most of these cranes are found on the four kilometer wide Demilitarized Zone near Panmunjom, while smaller numbers are seen east of that area near Inchon and in the far northeastern part of the country near Kangnung.

The Japan population of Japanese cranes

Japanese crane.

White-naped crane.

was reduced to about 30 individuals before artificial feeding began some 30 years ago. Removal of food as a limiting factor in winter, helped the crane population which by 1970 had increased to about 200 birds. We reasoned that feeding stations on the Korean wintering grounds would likewise result in an increase in numbers of the mainland population.

In December 1974, a feeding station was established near Taesong Dong in the heart of the Demilitarized Zone with about 30 cranes benefiting from the corn that was scattered daily over several frozen rice fields. In 1975, the feeding was continued by the Korean Council for Crane Preservation, a private organization dedicated to crane study, and conservation.

The White-naped crane is a regular and locally numerous winter visitor to South Korea. In late October approximately 1500 cranes arrive from their northeast Mongolian and north China breeding grounds at the Han River Estuary just south of the Demilitarized Zone and about 32 miles northwest of Seoul. They remain on the Estuary through November, then as the weather becomes colder, about 350 migrate to an artificial feeding station near Izumi, Kagoshima Prefecture, Japan. The remainder of the White-naped cranes either remain on the Han River Estuary or they migrate south to as yet undetermined locations in South Korea. They again return to the Han River Estuary from late February until mid March.

Unlike the Japanese crane which frequents fresh water streams and lakes during the winter where they secure a diet supposedly consisting of invertebrates and fish, the White-naped crane is a vegetarian on its wintering grounds feeding primarily on tubers of a tidal zone sedge, *Scirpus maritimus*.

The sedges grow in mud at the upper tidal zone and are usually not completely covered by water even at high tide. The cranes dig out sedge tubers from muddy soil and they do not readily excavate tubers in dry areas. Unfortunately diking of Koreas coastal wetlands for agricultural development has meant the loss of most of the White-naped crane's former winter habitat.

We lack information about the occurrence of winter populations of White-naped cranes in North Korea and China. However, historial records indicate the species traditionally wintered only in the southern part of the Korean peninsula and in Japan. The Han River Estuary is perhaps the last natural winter habitat for this rare species. Coastal wetland in other parts of South Korea and in southern Japan have been developed. Were it not for the artificial feeding program in Japan, the White-naped crane might well be unable to survive in the country.

In December 1974, we presented a proposal to the Ministry of Cultural Affairs of the Korean Government that the Han River Estuary be protected as a Natural Monument and survival of the White-naped crane (which itself is a Natural Monument) is dependent on the survival of its habitats. In February 1975, the Korean Government proclaimed the east bank of the Han River Estuary a Natural Monument.

Hopefully the feeding stations for the Japanese cranes in the vicinity of the Demilitarized Zone, and the preservation of the natural integrity of the Han River Estuary, will assure the continued survival and hopefully the increase of remnant populations of these majestic birds. (Dr. Kim Hon Kyu, Museum of Natural History, Ewha Womens University Seoul, Korea and Dr. George W. Archibald, International Crane Foundation Baraboo, Wisconsin, U.S.A.)

from **Asian Section News,** *International Council for Bird Preservation, November 1976*

SIBERIAN CRANES ARRIVE AT BHARATPUR

An ecological and behavioural study of the Siberian Crane *(Grus leucogeranus)* at the Ghana Waterbird Sanctuary at Bharatpur is under way and is being financed jointly by World Wildlife Fund-India and World Wildlife Fund-International.

The first of these beautiful winter migrants to arrive at Bharatpur were 4 large white birds who created a great deal of excitement at the Sanctuary. The reasons that these 4 birds were noticed among legions of other migratory waterfowl arriving at the world famous sanctuary is that they were Siberian Cranes – among the rarest and most spectacular birds in India.

The 4 Siberian Cranes that arrived in the latter half of November were the vanguard of a flock of approximately 65 of these elegant white birds that arrive in Bharatpur each year. This flock represents almost the entire Eastern population of the Siberian Cranes and all of them come to Bharatpur. They spend most of the winter "knee-deep" in the shallow jheels of the Bharatpur Sanctuary, busily digging for the roots of several kinds of water plants.

Among the snowy white adult birds will be several dappled brown and white "colts", youngsters hatched and raised earlier in the summer in the cold, barren wastes of Arctic Siberia. When only a few months old, the young birds follow their parents along the 5,000 km migration route between Siberia and India. A few never make it to India.

The Siberian Crane migrates to India to escape the hostile climate of a Siberian winter. Yet India has not always proved an ideal haven for this bird. For many years, the cranes were welcomed to India by a rifle and cooking pot. Thousands perished because their large size and brilliant white plumage presented an attractive target. Later, in the last century, the cranes began to lose their traditional feeding grounds as the large jheels of North and Central India were drained and converted to rice fields. Today, only the Bharatpur flock exists, an ironic tribute to the duck-hunting erstwhile Maharajas who, in flooding their lands to attract waterfowl, inadvertently created suitable habitat for the last Siberian Cranes in India.

The WWF study, being undertaken by Mr. Ron Saucy of the International Crane Foundation, will seek to determine why the Siberian Cranes prefer this particular sanctuary and hopes to make recommendations to the Government of Rajasthan on the best ways to ensure the survival of the Siberian Crane in the years ahead.

from **WORLD WILDLIFE FUND-INDIA**

Siberian cranes (Rao).

DALMA WILDLIFE SANCTUARY TO BE INAUGURATED

The declaration by the Bihar Government of Dalma Hill as a sanctuary is the culmination of the efforts of the Forest Department of Bihar, the Eastern Region of World Wildlife Fund-India, and other local conservationists.

The beautiful Dalma Hill, about 930 metres high, overlooks the industrial town of Jamshedpur and covers an area of 193 sq. km. of forested hills and valleys. This was once the home of leopard, tiger, cheetal and elephants. The Hill itself boasted of rich forest lands. Today, only a few wild elephants, barking deer, mouse deer, wild boar, leopard and an occasional tiger remain. Together with the bird life of the area, they are in need of urgent protection. The area has been, for centuries, the site of an annual tribal hunt which has reduced, each year, the precious wildlife of the area.

World Wildlife Fund-India took upon itself the challenging task of convincing the Adivasis to give up this age old hunt. They spoke to the tribal leaders, pleaded with the local population, organized a film show on wildlife and distributed leaflets urging the Adivasis to stop the hunt and cooperate with the Forest Department and World Wildlife Fund-India in their efforts to create a sanctuary for the flora and fauna in the area which, in the long run, would be in the interest of all concerned. World Wildlife Fund-India then hit upon the novel idea of taking some of the tribal leaders to the nearby Palamau National Park and showing them first-hand the wealth of wildlife and forests that this sanctuary contained. The tribal leaders were impressed with what they saw and urged that more of their people be taken on such visits. A village level sub-committee of World Wildlife Fund-India comprising the tribal leaders was formed, and local industrialists provided valuable and active assistance for these educational visits. The Adivasis now plan to give up their annual tribal hunt in this area and to support conservation efforts.

The second phase of the struggle to save Dalma Hill began when World Wildlife Fund-India began to actively solicit for donations from local public-minded organisations and companies to build up a fund for Dalma. Rs. 50,000 has been raised so far for this purpose. The Government of Bihar has formally declared Dalma Hill as a wildlife sanctuary and, with its inauguration on 18 December 1976, the Dalma Sanctuary is off to a promising start.

from **WORLD WILDLIFE FUND INDIA**

SUMATRAN RHINO IN KALIMANTAN (BORNEO)

by A.P.M. van der Zon

Throughout their range, the world's species of rhinoceros are endangered because of a false belief based on the mythical properties of their horns. (**TIGERPAPER** III: 2 and III: 3). The Sumatran rhino *(Dicerorhinus sumatrensis),* the only representative of the family in Kalimantan, faces another threat as well. This rhino is an animal which lives in primary forests, and due to the destruction of this habitat by loggers, its fate is in double jeopardy.

In 1931, the Sumatran rhino was declared a fully protected animal and until 1935 was reported frequently in the mountains of Kalimantan even though experiencing severe hunting pressure by the Dayak people with their spears and pit traps. From the few reports made since 1935 it seems that trapping has continued up to the present.

In recent years the rhino has only been reported from Kutai in East Kalimantan and in Kutai Nature Reserve which was specially designated for the survival of this animal; however it is believed that rhinos have been exterminated in the Reserve.

In 1976, I made a trip to check on the presence of the Sumatran rhino in an area north of Kutai and found two different sets of tracks. In central Kalimantan near Bukit Raya (the summit of Kalimantan) there was no evidence of rhinos seen during my one month expedition in the mountains. Also, according to the local Dayak villagers, there are no rhinos left in the central part of the mountain range.

Therefore, the only possible solution for the survival of the Sumatran rhino in Kalimantan is to extend Kutai Nature Reserve northwards. Unfortunately, this area has a high timber value and logging concessions have already been issued; however the companies have yet to commence logging operations.

Under these circumstances, it is imperative that conservationists throughout the world make a concerted effort to safeguard the Sumatran rhino as soon as possible. This means that action must be taken to revoke the logging concession, enforce strict penalties on rhino and timber poachers, and to make sincere appeals to the Dayak people to preserve this threatened animal in one of its last refuges in Southeast Asia.

The author is a biologist, who works with the FAO Nature Conservation and Wildlife Management Project. P.O. Box 2338, Jakarta, Indonesia.

Sundarban Forest showing Nypa fruticans and Sonnerata apetala

SUNDARBAN FOREST – BANGLADESH

Sundarban Forest is a tidal littoral estuarian mangrove forest situated in the southern part of Khulna district of Bangladesh and extending into India. The total area of the Sundarbans within Bangladesh covers about 5,600 sq. km., out of which 1,700 sq. km. are water areas. The Sundarbans are unique because of the special mangrove ecosystem. No other estuarian mangrove forest in the world contains so much commercially important flora and such a rich fauna.

The peculiarity of the Sundarbans is that it is a cluster of low-lying deltaic islands. Innumerable creeks meander through the forest not only carrying water and flooding the forest but they also greatly aid in the extraction of forest products.

An extensive part of the forest floor is flooded during the spring tides round the year and also during high tide in the monsoon months. Trees that grow in such areas must therefore have special adaptations. The trees have very thick leaves which reduce the loss of water due to transpiration and possess pneumatophores which take on the function of breathing. This is because though water is in abundance the amount of fresh water for intake by the plant is very little, a situation called physiological drought.

Sundarban Forest is a good example of what multiple use can be made of a well-managed forest.

Sundri *(Heritiera minor)* is the most important tree species. The timber is used for construction of boats and houses, transmission poles, bridge piles, jute mill bobins, hard-board, etc. Sundri supplies almost 10% of the needed fuel wood of Bangladesh. Sundri constitutes about 73% of the total growing stock, yielding annually 7.2 million cubic feet.

Gewa *(Excoecaria agallocha)* constitutes about 16% of the crop. The timber is used for manufacture of newsprint, matchboxes and splints, and packing boxes. Sundarban gewa feeds Khulna newsprint mills and six match factories. The annual yield of gewa is 7.61 million cubic feet, the bulk of which is reserved for the newsprint mills.

Passur *(Carapa meluccensis)*, Kakra *(Bruguiera gymnorhiza)*, Keora *(Sonneratia apetala)*, and Bain *(Avicennia officinalis)* are used for furniture, house and boat construction.

Goran *(Ceriops candelleana)* is used as purlin and rafters for village huts and also as fencing posts but most importantly as firewood.

Golpata *(Nipa fruticans)* is a lush green palm, growing along the slopes and banks of the innumerable creeks and rives. The annual yield of golpata varies from 75-80 million kilograms. Sundarban golpata supplies roofs for 65,000 houses a year.

Honey and beewax - Sundarban's Khalshi *(Aegiceras majus)* and Goran flowers are famous for sweet, fragrant honey. The average yield of honey per year is 200,000 kg. and that of beewax varies from 40,000 - 45,000 kg.

Lime - Many people of the Satkhira sub-

division of Khulna district earn a living collecting shells which when burnt produce about 3 million kg. of lime a year.

Tannin - Tannin is produced from the bark of Goran, a typical mangrove species.

Fish - The fishery potentials of the Sundarbans are well-known. Some of the important seasonal fishing camps like Doobla, Nilkamal, Katka and Malancha produce thousands of kg. of dry fish, some of which is also exported. The total annual catch of different types of fishes in terms of fresh weight varies from 25 - 30 million kg. Shrimp culture in some of the peripheral zones of the Sundarbans is being widely developed.

In addition to this production, the Sundarbans are also well-known for their fauna, most famous of which is the Royal bengal tiger. The original abundance of tigers in the Sundarbans depended on the relatively small number of hunters in those days who were prepared to seek them in the difficult conditions of the tidal jungle and on the large numbers of swamp deer which were part of their prey. In more recent times the situation changed radically. Hunters could penetrate the entire delta region by motor launch and were equipped with accurate weapons. The swamp deer were soon exterminated, leaving only the reduced number of spotted deer and wild boar to prey on, and the population of tigers fell more steeply each year. Moreover, because of the reduction of prey animals tigers occasionally turned to killing wood-cutters, honey-collecters and fishermen. In consequence, a bounty was put on the tiger for a number of years. Fortunately the Government of Bangladesh has realized the danger to the tiger and it is now fully protected under the Wildlife Preservation Order 1973.

This forest is an ideal habitat for the beautiful spotted deer *(Axis axis)* which are very abundant and form the main prey of the tiger.

The estuarine crocodile *(Crocodilus porosus)* can be seen during the winter in most of the rivers during low tide when they come out for basking in the sun. The Sundarbans' reptiles like python *(Python molurus)* and King cobra *(Ophiophagus hannah)* are well-known. The ring lizards *(Varanus griscus)* are now rare and measures are being undertaken to increase their numbers.

Varieties of king fishers are a sight to see. The Sundarbans' curlews, snipes, storks and seagulls add to its scenic beauty.

Besides Rhesus macaques *(Macaca mulatta)* there are many Crab-eating macaques *(Macaca fascicularis)*. The crossing of rivers by Rhesus macaques sitting on the backs of herds of deer has been observed on several occasions.

During the 1970 tidal bore and the war of liberation in 1971, large numbers of wild animals were lost. This reduced the Sundarban fauna.

At present for the preservation of the fauna, three game sanctuaries have been established and the number of wild animals is increasing. The three sanctuaries cover 320 sq. km. Although all animals are protected in the Sundarbans, the sanctuaries provide an even safer place since all human activity is banned.

An average of about 45,000 people work daily inside the Sundarban Forest. For handling the timber, fuel, golpatta, fish, etc., about 135,000-150,000 boats having an average capacity of 8,000-12,000 kg. are used per year. A minimum of two persons work in each boat. The industries and trade based on Sundarban products employ about 25,000 persons throughout the year.

In spite of all this human presence and activity the Sundarbans form an area with outstanding conditions for wildlife. These are based on the fact

Spotted deer

that the area is very extensive, there are no human settlements or cattle within the Sundarbans, and most important, the area's management is based on ecological principles.

Mangrove species can tolerate a certain amount of salinity but they grow better if the supply of fresh water from above is abundant. If the salinity of water and soil increases, at first the quality of the trees deteriorates and finally they start to die. With the decrease of the flow of light fresh water from the upland main rivers there is always a corresponding increase of the upward flow of heavy salt-carrying sea water. If the salinity of water increases due to evaporation during the dry months, there is a heavy concentration of salt on the surface soil. All mangrove species have peculiar root development. The roots do not go very deep into the soil, but instead spread laterally. So with the concentration of salt on the surface soil, the plants cannot absorb their requirement of nutrient elements. In fact due to negative osmotic pressure there can be an outward flow of fluid from the plant rather than the normal inward flow.

The Sundarbans are situated in the deltaic zone of the Ganges, and the Ganges is the only river through which the Sundarban forests get their supply of fresh water, which is particularly essential during the dry period. Adverse effects of closure of the Ganges at Farakka were noticed during the lean months of 1975-76. The eastern side of the Sundarban benefits from a relatively low salinity which results in a more luxuriant growth of the vegetation. The dominant tree species (Sundri, Gewa, Keora, etc.) grow to a greater height here and provide adequate shelter and food for wildlife. Chital are more numerous here than in the other lower parts of the delta. The ecological effects of the dam at Farakka should be seen in connection with this.

If the reduced supply of water of the Ganges continues, obviously the entire mangrove ecosystem will be upset. Consequently, a grave situation will result when all the mangrove vegetation and fauna disappear, giving rise to a semi-desert condition which will ultimately exert an adverse influence on the ecosystem and socio-economic conditions of the entire region.

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Brahmini kite

TUNG TONG WATERFOWL RESERVE

Since July 1976 I have had the opportunity to conduct a preliminary wildlife survey of Tung Tong Waterfowl Reserve which is in Surat Thani Province, Peninsular Thailand. The main purpose of the project is to see what avian species are found in the area and when and where they are likely to occur. Since the area must be treated as a complete ecosystem, other species are also being surveyed. Since Tung Tong has been designated as a reserve rather than a wildlife sanctuary, economic ventures such as fishing and agriculture are still allowed, therefore, another purpose of this project is to see what effects these ventures have on the ecosystem.

At least 39 species of birds have been tallied, most of these being the smaller passerine species since the larger migratory species such as Little cormorant *(Phalacrocorax niger),* Purple heron *(Ardea purpurea),* and egrets *(Egretta spp.)* have not yet arrived at the wintering grounds. Identification of many of the smaller species is proving to be very difficult because of their small size, protective coloration, and choice of habitat in the forest canopy. Because of this, a mist netting project was started in September. Eight mammalian species have also been recorded, the most notable of these being a Golden cat *(Felis temminckii).* A live trapping program of small mammals has also been initiated. Six species of amphibians, 7 species of fish, and 4 species of reptiles have also been collected.

Generally speaking, there are four habitats available to the fauna at Tung Tong: grassland, cultivated land, marsh, and swamp forest. Since water is one of the most critical limiting factors at waterfowl habitats, provisions have been made to monitor various parameters such as depth, temperature, and light penetration.

Tung Tong can be reached by road from Surat Thani City where a boat can be hired to travel to the Reserve. Any interested persons or groups that would like to visit the Reserve or anybody with information on the flora or fauna; please contact:

Philip Storer
Provincial Forestry Office
Surat Thani, Thailand

CONSERVATION OF NATURE AND FUTURE OF MANKIND (MAN AND CROCODILE)

by Lala A.K. Singh

Natural resources form the mainstay of a country's economy and are so well interwoven with the life and culture of the inhabitants that they cannot be viewed separately. But any natural resource, if not managed or utilized correctly will cease to be an advantage to the people who own it.

The Satkoshia Gorge of River Mahanadi, Orissa, means literally, "fourteen mile stretch of the river." The river is narrowest and deepest in the gorge area, fanning out at either end. The mountains on either side are high, some reaching over 700 metres. The mountains have thick mixed sal *(Shorea robusta)* forests, which form the habitat of many wild animals, most common of which are: elephant, cheetal, barking deer, sambhar, wild boar, hyena, langur, hare, porcupine, bison, leopard and tiger. The river, with its deep flowing water, good sand banks and rich nutrient supply, harbours many fish, forming an ideal, fairly undisturbed crocodilian habitat, particularly for the gharials - the long-snouted, fish-eating crocodilian endemic to the Indian sub-continent. Fifteen-twenty years ago there were literally hundreds of gharials *(Gavialis gangeticus)* and some mugger crocodiles *(Crocodilus palustris)* in the gorge, but today only five gharials and six muggers remain.

The crocodilian population in the country has decreased because of indiscriminate hunting, destruction of both juveniles and adults by nylon set nets used for fishing, collection of eggs for food and habitat destruction.

Before the late 1950's when there were many crocodilians in the gorge, the fish population was also at its peak. The people living on either sides of the gorge and at places many miles up and downstream earned their livelihood by fishing in the gorge or in the ecotone areas at either end. At that time, both the size of the catch and the size of the fish were big. Some fish were enormous weighing over 80 kg.

Gharials are fish-eaters, and are the main predators of coarse fish - the scale-less fish - which are less preferred by humans. These scale-less fish are predators themselves, consuming huge amounts of fish each day. Thus the large numbers of crocodilians maintained a biological control over the predator fish population, ensuring a good catch for the fishermen. Similar instances of correlation between fishery and crocodilian populations has been observed in other countries, notably Africa.

A sudden post-war increase in the demand for crocodilian skins resulted in the indiscriminate slaughter of crocodilians. This affected first the population of crocodilians and then the fish, producing a sudden upset in the ecosystem of the gorge. Now only a few gharials and crocodiles remain in the area along with a small number of fish, none of which are of the enormous size once found there. This situation could have been avoided if there had been proper management of the harvesting of crocs. Unregulated exploitation of natural resources acts as a bomerang to human civilization itself.

When fishing was no longer lucrative, most fishermen took up cultivation as a part- or full-time engagement. Today there are some fishermen who are now entirely cultivators; most however, combine the two professions, while a few still fully depend on fishing in the gorge.

Those who continued their fishing profession, faced a critical state when the catch was very low. They had to employ modern methods by using nylon set nets. This yielded a good catch for the first few years. They had nets of different designs so as to catch fish of all sizes. This subsequently resulted in a great loss to fishery as most breeding size fish were caught. Further, the introduction of nylon set nets also resulted in the destruction of the remaining gharials and crocodiles in the river. Crocodilians, when caught in a nylon net, cannot struggle their way out and can easily drown. If they do escape drowning, they are brought out along with the fishes, only to be clubbed to death. The Munda and Kuda tribals eat the meat and the skin is sold at a very low price.

Those who took up cultivation had to clear forest areas to convert them into fields. They chose areas just beside the river bank which created another serious problem and aggravated the situation already prevailing due to existing shifting cultivation practices. Due to deforestation all wild animals inhabiting

the area face habitat destruction. Some may manage to survive in new areas while others will not, often falling prey to humans. A similar loss also occurs for many other forest products. The local people who pay their annual visit to the forest to collect honey lose a part of their income. Erosion of the soil on the river bank starts to occur. The river encroaches on the riverside habitation, forcing some people to shift their houses. Another effect of soil erosion is the deposition of sand and soil on the river bed. The river looks completely different today from former years. Today during the dry season, large sand patches extending over miles make their appearance opposite every bend of the river. This is partly due to damming in the upper river at Hirakud. Due to this deposition at the bottom, the bed of the river rises up and during a flood there is a greater chance of overflow inundating the nearby habitation.

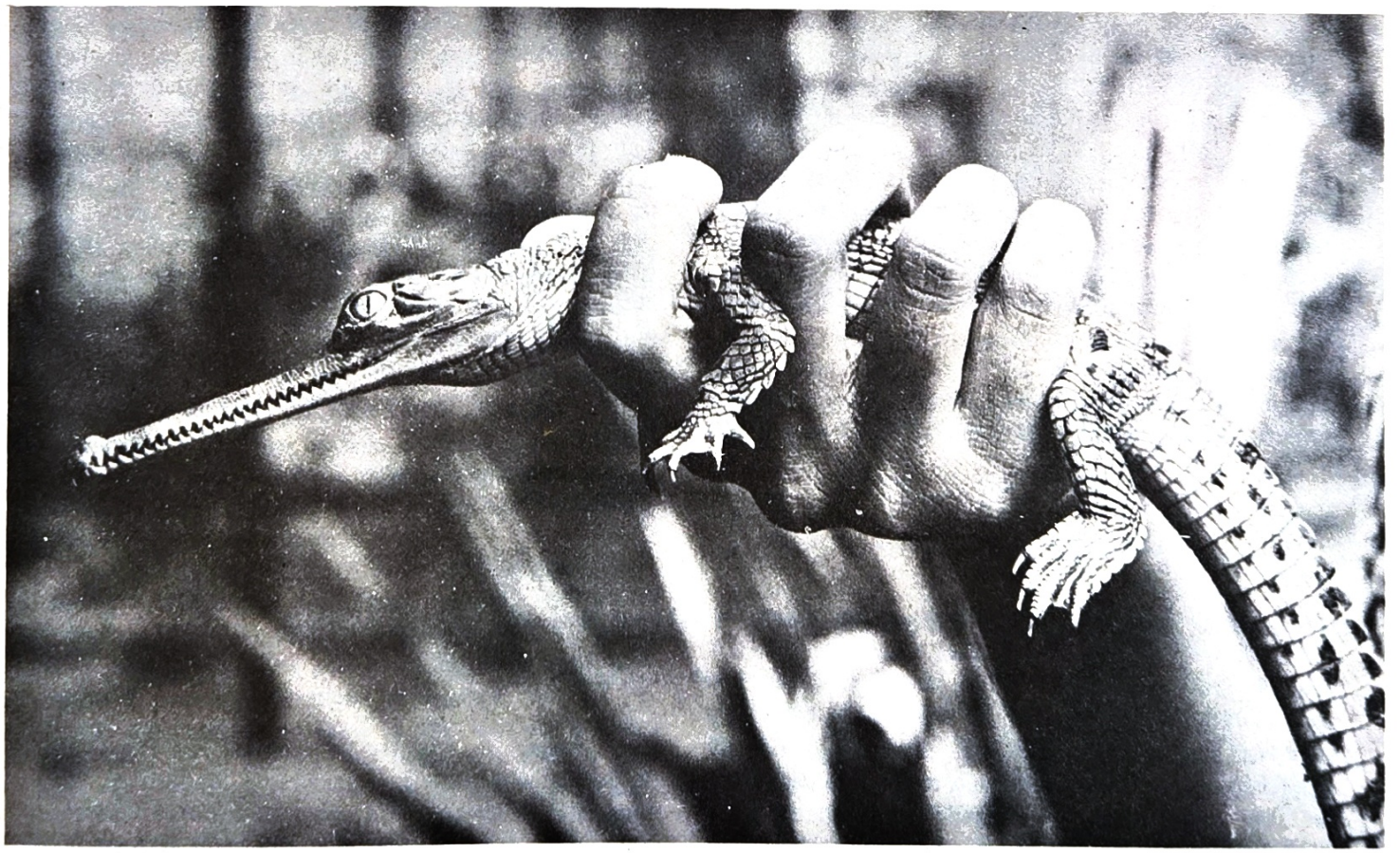
Some individuals supplement their incomes by smuggling timber and bamboo along with fire wood. This contributes to the thinning out of forests, producing the same effect, though to a lesser extent, as does complete deforestation. Frequent forest fires add to the disturbances. The State Forest Department is very much concerned about these problems and their approaches to forest utilization are gradually becoming more scientific, looking for future prospects.

The last consideration is from a different angle - from a tourist's point of view. People now dream to breathe fresh air, and enjoy the beauty and solitude of nature. They desire to roam within some virgin forest to enjoy a day's walk and a night's spotting of wild animals. We had all of these on our own land, but today we have lost most of them due to our own defective management. We have still some of these assets in the Satkoshia Gorge itself. Let us preserve these treasures for ourselves, for others, and for the future. This would help the economy of the country by earning the much needed foreign exchange and also the economy of the local Oriyan people who can take visitors on a boating excursion or sell some of the forest products to the visitors or act as guides. However, at the same time we must not encourage tourism to such an extent that it destroys what we are trying to preserve.

We cannot afford to condone the economic development of a handful of persons who slaughter crocodiles and gharials at the cost of the entire living system of a section of the community. We must safeguard the assets of future generations of citizens.

Now is the time to start to recognise that the different crocodilians are of great importance to the balanced ecosystem, are economically valuable as a natural resource in themselves, and above all play a role in mankind's future. When the last wild populations of crocodilians are gone, it will be too late to have regrets.

The author is a Research Scholar, Gharial Research and Conservation Unit, Tikerpada 759122, India.



Baby gharial at Orissa Crocodilian Rehabilitation Unit

THE NEED FOR AN INTERNATIONAL WILDLIFE COLLEGE

Letter by Arjan Singh

Wildlife has always had an identity in Africa, initially as a hunter's quarry and subsequently as a tourist attraction, but wildlife management in India had a slow start. When wildlife management came on to the national curriculae it was considered that as wildlife lived mainly in forests, the Forest Department should look after this nascent subject.

Twenty-five years ago when the Forest Department assumed the management of wildlife, the situation was a sad one. The meagre staff allotted to the protection of wildlife was utilized for extra-curricular activities, and for a considerable time the downward trend of habitat destruction initiated by the over-utilisation of the war years continued. Gradually, it was recognized that wildlife had to have a built-in infrastructure of its own, but even this realization was fraught with difficulties. Inexperienced personnel were posted to look after wildlife, who were not necessarily enthusiastic about their new vocation. There was a rapid turnover in wildlife personnel and only a small number of officers were in a post long enough to fully appreciate the importance of wildlife. Instances of staff members without adequate supervision, turning a blind eye to poachers occurred, and some Forest Officers themselves sought to secure petty hunting privileges from a dwindling resource. This was probably the most prolonged phase as Forests and Wildlife were State subjects under the Constitution, and the enlightened Central Government was unable to influence the anti-wildlife policies influenced by political pressures. Over-felling of forests in mountain districts led to massive erosion and floods in the adjoining states. Over-felling in some states led to lack of precipitation and drought in others, and there seemed to be no remedy. The Indian Wildlife Act of 1972 nationalized the wildlife concept to modern standards, but the states were often slow to implement the policies and much of the good intentions of the Act remained on the statute book. The Central Government accepted the principle of a built-in integrity for wildlife, and circulated a proposal for a Wildlife Wing of the Forest Service under a joint Chief, but otherwise independent in matters of emolument, promotion, and security of tenure. This proposal was not acted upon. However, recently Forest and Wildlife have become a Central subject on the concurrent list whereby the Central Government can legislate on these subjects, and a constitutional lacuna in favour of wildlife was filled. With this amendment, wildlife has entered a new era. The uphill struggle for a breathing space for wildlife has now ended and if we can construct a suitable infrastructure for the protection and management of wildlife, we will be continuing the process of evolution which commenced over twenty-five years ago with a dim realization by a few early conservationists. Initially it is necessary to separate Wildlife from the Forest Department, for though forests constitute the main habitat of wildlife, it must be realized that scientific management of either subject is incompatible with an equal treatment of the other. A felled tree so essential for Forestry means a loss of habitat for reptiles, rodents, birds and other life forms.

In conclusion, I must say that the gradual but increasing awareness that we must do something for wildlife to survive for its integral state does offer a hope for the future, but it is necessary to consolidate the gains we have made over the past and learn our lessons for the future.

In order not to dissipate the realisations achieved over the years it is essential that an independent Wildlife Service with its own training college be established which will teach wildlife management principles. Better still an International Wildlife College should be set up, like the one at Mweka in Tanzania, with assistance from F.A.O., which would serve as a professional training school for the whole of Asia in order to build up a staff of experts, not only for India's wildlife, but for the benefit of all other countries in Asia. Hopefully all nations concerned will give and receive unrestricted permission and encouragement to send their wildlife managers to such an international training course, for which there is an urgent need which transcends political barriers.

THE ROLE OF FAO IN WILDLIFE CONSERVATION

Letter by Boonsong Lekagul

It seems very clear that mankind is rapidly approaching a crisis as the non-renewable resources of the world become depleted; it is equally clear that the future of mankind must therefore be based on the support of renewable resources such as soil, water, forests and wildlife.

Basing a country's economy on renewable resources will take a considerable amount of planning and foresight, but most developing countries are unable for political, economic, or bureaucratic reasons to make effective long-term plans. It thus seems that FAO and other international organiza-

tions should be able to play a most significant role in long-term planning, but on the contrary, FAO seems to be slipping into the trap of primarily responding to crisis situations such as famines, floods, or droughts. The long-term perspective is being lost because of the press of human population on the available resources, and this may actually worsen the situation rather than improve it. The clearing of forests on marginal land for short-term agriculture is an outstanding example of this phenomenon, leading to the destruction of production forests, watersheds, and wildlife.

One bright spot in an otherwise rather dismal picture is the FAO involvement in wildlife conservation, clearly demonstrating at least some concern for this renewable resource and its importance in the food production system. But for this resource to be conserved, it must be managed and protected from over-exploitation. Unfortunately, wildlife management is a very new discipline in Asia and many countries lack the expertise necessary to prevent their wildlife being hunted to extinction by village hunters and wildlife habitat being destroyed by foreign demand for timber. At the same time, most governments are well aware of the need for forest and wildlife conservation and are very happy to accept support from such organizations as FAO, particularly when such support will help the countries to train their own personnel, to survey their existing resources, to develop management plans for their reserves and national parks, to publicize their conservation efforts in the world press, and to demonstrate some of the ways wildlife can be fitted into the economic structure of the country.

FAO wildlife projects in the Oriental region include a project in Nepal to help establish a set of national parks and reserves, of which Mt. Everest National Park and Chitawan National Park are two sterling examples; a somewhat smaller project in Indonesia with similar goals; a crocodile project in India; and the support of the TIGERPAPER in the Bangkok Regional Office. But what of the future? Will FAO continue its support for wildlife conservation? Will the project in Indonesia be expanded as planned? Will the TIGERPAPER continue to be supported? Will there be new projects in the region, such as the proposal for a wildlife management project in Thailand (which was shelved when the UNDP budget crisis hit last year)?

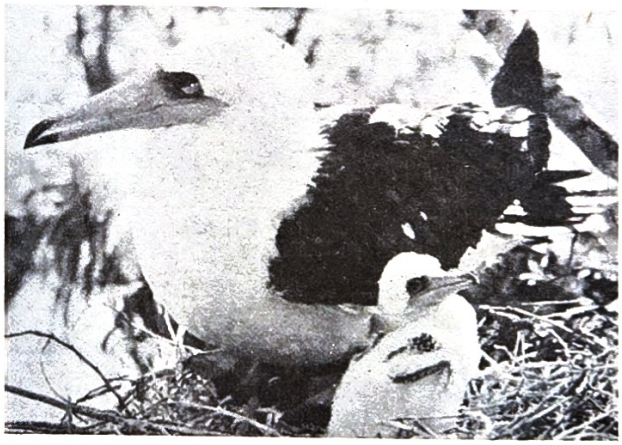
It is our strong hope that FAO, because of its leading position in supporting rational utilization of natural resources through long-term land use planning, will continue its present wildlife management programs and expand them at a rapid rate in the future. Such programs may be the best chance for Asian wildlife to last out the twentieth century and contribute to human well-being far into the future.

Boonsong Lekagul, Secretary General, Association for the Conservation of Wildlife, 4 Old Custom House Lane, Bangkok, Thailand.

TIMBER FROM GUNUNG LEUSER

The internationally well-known Gunung Leuser Reserve in northern Sumatra, Indonesia, suffers regularly from threats from the outside world. Presently a timber concession has been granted to a plywood factory for 30,000 ha of the Reserve's most valuable tropical lowland evergreen rain forest.

The area which is being given under concession is called Sikundur, and is the largest patch of lowland forest in the Reserve. If the concession goes through, almost half of all the lowland forest of the Gunung Leuser Reserve will be destroyed, which will have serious effects on the animal populations in the Reserve. There are still a good number of elephants in Sikundur which will ultimately face death if nothing is done to halt the destruction. Other animals which can be found in the threatened forest are endangered species such as the Sumatran rhino, Clouded leopard, Orang utan and the Sumatran tiger.



Abbott's boobies (Nelson)

RECTIFICATION

Our thanks to Mr. D. Purchase, Division of Wildlife Research (CSIRO) Australia, for correcting an error found in TIGERPAPER IV: 1. We published an article by the World Wildlife Fund Marine Program, "The Seas Must Live", which placed the Christmas Island frigate bird, Abbott's booby, and the Christmas Island silvereye on the Christmas Island in the South Pacific Ocean. The correct location should be the Christmas Island in the Indian Ocean.

CAPTIVE BREEDING AND WILDLIFE CONSERVATION

Habitat destruction, poaching, illegal trade in products of endangered species and disappearance of principal prey species have all conspired to bring many animal species to the brink of extinction. For some of them, the only hope for survival of the species will be a successful captive breeding programme whereby the numbers of rare species can be rebuilt to optimum levels and re-introduced into their natural habitat.

Under the leadership of the Zoo Director's Union, breeding of zoo stocks is given priority. Zoos have played a unique role in successful breeding of rare animals, which in the wild have no chance of survival. Typical examples are Pere David's deer, Przewalski's horse, European and American bison, Arabian oryx and Nene goose. Zoos of the world are taking a responsibility in conserving species. (Jarvis, 1965)

Smooth Indian otter

This is by no means an easy undertaking. Success in breeding animals in captivity does not rest entirely on living conditions and nutrition. It is a complicated affair which requires constant observation, patience and common sense. It depends on the time an animal takes to acclimatize and develop confidence. It also depends on the individual behavior of the animals.

Several zoos have had success in breeding captive animals. But sometimes zoo managers have paid too much attention to breeding unusual forms and even freaks in order to attract more visitors. The extent to which white tigers are being bred certainly points in that direction. Although an original white tiger was captured in the wild, the present white tiger populations at several zoos do not reflect in any way the occurrence of the two color varieties in the wild. Some people already believe that there are areas in India where only white tigers occur. Here the educative function of zoos has clearly been warped.

Delhi Zoological Park was the first to have bred the Smooth Indian otter *(Lutrogale perspicillata)*. The otters are kept in a large, open enclosure fronted by a dry moat. There is an L-shaped pool in the center which contains a small island. The strip of ground between the pool and the dry moat is filled with earth and sand where the otters can build their own dens. Almost all of the young born in the zoo were successfully reared by the parents. Other zoos which have successfully bred Lutrogale are Jaipur and Twycross Zoos.

The Delhi Zoo has been uncommonly successful in breeding, rearing, and maintaining other rare animals such as the Brow-antlered deer *(Cervus eldi)*. In 1960 only about 100 of these deer existed in a small area of Manipur in eastern India, the only place where they are found (Gee, 1960). Between 1963 and 1968, 8 successful matings between Brow-antlered deer occurred in Delhi Zoo, each one producing a single fawn.

The population of Lion-tailed macaques *(Macaca silenus)* is reported to number less than 1,000 individuals in its native habitat in southern India (Sugiyama, 1968). As of March 1975, 62 specimens were living in 16 Indian zoos. However, only three of these establishments including the Delhi Zoo had been successful in breeding the species. The Delhi colony stems from a four-year-old pair received as a gift in September 1959, and has produced 15 births in the past 12 years. The colony is displayed on an island enclosure surrounded

Manipur brow-antlered deer

by a water moat. It supports a natural growth of vegetation on which the macaques browse, in addition to their zoo diet. The original pair had quickly acclimatised to their island home and all specimens since have enjoyed good health and suffered no serious ailments. Although births have taken place from March to November, the maximum number of births was reported in April and May, which is interesting in view of Prater's report (1971) that newborn young are seen regularly in southern India in the month of September. The Delhi Zoo attributes the success of the colony to an adequate diet, sufficient space for exercise and a semi-natural captive environment.

The Great Indian one-horned rhinoceros *(Rhinoceros unicornis)*, like all rhinoceroses, does not breed easily in captivity. The rhino enclosure at Delhi Zoo is an open air enclosure covering about one acre. It has a luxuriant growth of naturally growing trees and an undergrowth of *Prosopis juliflora.* In the center of the enclosure a wallow has been provided. In January 1971, a 9-year-old female gave birth to a single calf.

Delhi Zoo is the only zoo in the world to have bred the Nilgiri langur *(Presbytis johni)* in captivity. Studies made by the Bombay Natural History Society demonstrate that if the recent forest utilization practices are allowed to continue, both the Nilgiri langur and Lion-tailed macaque will be extinct within a couple of decades (Hill, 1960).

There is still too little knowledge about the behavior, social relationships and diet requirements of many species, all of which need scientific investigation and coordinated research. Many examples of failure of conservation projects have been due to lack of ecological data on the particular species concerned. Since most animals are extremely secretive in their native haunts, a zoo is a good place to study their behavior patterns, even though they do not always reflect the patterns in the wild. The Delhi Zoological Park is actively engaged in such scientific projects.

Zoological parks and zoo gardens have been some of the biggest consumers of wildlife of the world. But the new concept of zoo management of displaying only a few animals and birds in, as far as possible, self-contained eco-units, imparting education to raise conservation consciousness among people, conducting research to discover unknown facts about wild animals for better understanding their physical and psychological needs, and breeding rare and vanishing species for re-introduction in depleted areas, is fast changing the position. Zoos are becoming new reservoirs of wildlife and increasingly important for wildlife conservation.

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LIST OF ENDANGERED SPECIES

In **Tigerpaper IV: 1** we published a letter from Miss L.J. Thornback, who is currently involved in revising Volume One, Mammalia, of the **Red Data Book.**

Since then we have received many requests for the list of endangered species in the countries in the Asia-Pacific Region.

Therefore we have decided to publish the complete list. The species are listed in alphabetical order by their Latin names. The countries or areas in which they occur are indicated behind the species name, using an abbreviation for each. The abbreviations are indicated between the brackets following the country or area name: Afghanistan (AF) Australia (AU) Bangladesh (BD) Bhutan (BT) Burma (BU) China (CH) Democratic Kampuchea (DK) India (IN) Indonesia (ID) Japan (JP) Korea (KO) Laos (LA) Malaysia (MA) Mariana Islands (MI) Mongolia (MO) Nepal (NE) New Caledonia (NC) New Guinea (NG) Oceans (OC) Pakistan (PA) Palau Islands (PI) Philippines (PH) Solomon Islands (SI) Sri Lanka (SL) Taiwan (TW) Thailand (TH) USSR (UR) Vietnam (VN).

We would like to point out that the list below covers the species which are presently included in the **Red Data Book.** Since the Book will be revised the list automatically will be revised as well.

Acinonyx jubatus venaticus - Asiatic cheetah UR, AF, PA
Ailuropoda melanoleuca - Giant panda CH
Antechinomys laniger - Eastern jerboa marsupial AU
Antechinus apicalis - Dibbler AU
Axis calamianensis - Calamian deer PH
Axis kuhli - Kuhl's deer ID
Balaena mysticetus - Bowhead whale OC
Balaenoptera musculus - Blue whale OC
Balaenoptera physalus - Fin whale OC
Bettongia lesueur - Lesueur's rat-kangaroo AU
Bettongia tropica - Northern rat-kangaroo AU
Bos banteng - Banteng ID
Bos gaurus - Gaur BU, DK, IN, LA, MA, NE, TH, VN
Bos grunniens - Wild yak CH, IN, NE
Bos sauveli - Kouprey DK, LA, TH, VN
Bubalus bubalis - Asiatic buffalo BU, DK, IN, LA, MA, NE, PH, SL, TH, VN
Bubalus (Anoa) depressicornis - Lowland anoa ID
Bubalus (Anoa) mindorensis - Tamaraw PH
Bubalus (Anoa) quarlesi - Mountain anoa ID
Budorcas taxicolor bedfordi - Golden takin CH
Budorcas taxicolor tibetana - Szechwan takin CH
Caloprymnus campestris - Desert rat-kangaroo AU
Camelus bactrianus - Wild bactrian camel CH, MO
Canis lupus - Wolf BT, BD, CH, IN, KO, MO, NE, PA, UR, AF
Capra falconeri - Markhor AF, IN, PA, UR
Capra falconeri chiltanensis - Chiltan markhor PA
Capra falconeri jerdoni - Straight-horned markhor AF, PA
Capra falconeri megaceros - Kabul markhor AF, PA
Capricornis sumatraensis sumatraensis - Sumatran serow ID
Caprolagus hispidus - Assam rabbit IN
Cervus albirostris - Thorold's deer CH
Cervus canadensis macneilli - M'Neills's deer CH
Cervus duvauceli - Swamp deer IN, NE
Cervus elaphus bactrianus - Bactrian deer UR, AF
Cervus elaphus hanglu - Kashmir stag or Hangul IN
Cervus elaphus wallichi - Shou BT, CH
Cervus elaphus yarkandensis - Yarkand deer CH
Cervus eldi eldi - Manipur brow-antlered deer IN
Cervus eldi siamensis - Thailand brow-antlered deer DK, LA, TH, VN
Cervus nippon grassianus - Shansi sika CH
Cervus nippon keramae - Ryukyu sika JP
Cervus nippon kopschi - South China sika CH
Cervus nippon mandarinus - North China sika CH
Cervus nippon taiouanus - Formosan sika TW
Chaeropus ecaudatus - Pig-footed bandicoot AU
Cuon alpinus - Asiatic wild dog BD, BT, CH, KO, MO, UR, BU, VN, DK, IM, ID, LA, MA, NE, PA, TH
Desmana moschata - Russian desman UR
Didermocerus sumatrensis - Sumatran rhinoceros IN, BD, BU, DK, ID, LA, MA, TH, VN
Dugong dugon - Dugong AU, BU, ID, IN, JP, MA, NC, PI, SI, SL, TW, PH, NG
Elaphus maximus - Asian elephant BT, BU, DK, IN, LA, MA, NE, ID, SL, TH, VN
Equus hemionus - Asiatic wild ass CH, MO, UR
Equus hemionus khur - Indian wild ass IN, PA
Equus przewalskii - Przewalski's horse CH, MO
Eubalaena glacialis - Black right whale OC
Felis caracal michaelis - Turkmenian caracal lynx UR
Gymnobelideus leadbeateri - Leadbeater's possum AU
Hemitragus hylocrius - Nilgiri tahr IN
Hylobates klossi - Kloss's gibbon ID
Hylobates pileatus - Pileated gibbon DK, TH
Lagorchestes hirsutus - Western hare-wallaby AU
Lagostrophus fasciatus - Banded hare-wallaby AU
Lariscus hosei - Four-striped ground squirrel MA
Lasiorhinus barnardi - Queensland hairy-nosed wombat AU
Lipotes vexillifer - Whitefin dolphin CH
Macaca silenus - Lion-tailed macaque IN
Macropus parma - Parma wallaby AU

Golden langur

Macrotis lagiotus - Rabbit bandicoot AU
Marmota menzbieri - Menzbier's marmot UR
Megaptera novaenglia - Humpback whale OC
Melursus ursinus - Sloth bear IN, NE, SL
Mochus moschiferus moschiferus - Himalayan musk deer BT, BU, CH, IN, NE, PA
Muntiacus crinifrons - Black muntjac CH
Muntiacus feae - Fea's muntjac BU, TH
Neofelis nebulosa - Clouded leopard BD, BT, BU, CH, DK, IN, ID, LA, MA, NE, TH, VN
Neofelis nebulosa brachyurus - Formosan clouded leopard TW
Nesolagus netscheri - Sumatra short-eared rabbit ID
Odobenus rosmarus laptevi - Laptev walrus UR
Onychogalea fraenata - Bridle nail-tailed wallaby AU
Onychogalea lunata - Crescent nail-tailed wallaby AU
Panthera leo persica - Asiatic lion IN
Panthera pardus - Leopard AF, BD, BT, CH, DK, ID, IN, LA, MA, NE, PA, UR, TH, VN
Panthera pardus orientalis - Amur leopard CH, KO, UR
Panthera pardus tulliana - Anatolian leopard UR
Panthera tigris altaica - Siberian tiger CH, KO, UR
Panthera tigris amoyensis - Chinese tiger CH
Panthera tigris balica - Bali tiger ID
Panthera tigris corbetti - Indochinese tiger BU, CH, DK, LA, MA, TH, VN
Panthera tigris sondaica - Javan tiger ID
Panthera tigris sumatrae - Sumatran tiger ID
Panthera tigris tigris - Indian tiger BD, BT, BU, CH, AF, IN, NE
Panthera tigris virgata - Caspian tiger UR, AF
Panthera uncia - Snow leopard AF, BT, CH, IN, MO, PA, UR
Pentalagus furnessi - Ryukyu rabbit JP
Petrogale xanthopus - Yellow-footed rock wallaby AU
Phascogale calura - Red-tailed phascogale AU
Phoca kurilensis - Kurile harbour seal JP, UR
Planigale subtilissima - Kimberley planigale AU
Planigale tenuirostris - Narrow-nosed planigale AU
Platanista indi - Indus dolphin IN, PA
Podogymnura truei - Mindanao gymnure PH
Pongo pygmaeus - Orang-utan ID, MA
Presbytis geei - Golden langur IN, BT
Presbytis johnii - John's langur IN
Prionailurus (Mayailurus) iriomtensis - Iriomote cat JP
Pteropus mariannus - Marianus flying fox MI
Pteropus tokudae - Guam flying fox MI
Pygathrix nemaeus - Douc langur CH, LA, VN
Rhinoceros sondaicus - Javan rhinoceros BU, ID, LA, TH
Rhinoceros unicornis - Great Indian rhinoceros IN, NE
Rhinopithecus roxellanae - Snub-nosed langur CH, IN
Selenarctos thibetanus gedrosianus - Baluchistan bear PA
Simias concolor - Pig-tailed langur ID
Sminthopsis longicaudata - Long-tailed sminthopsis AU
Sus salvanius - Pygmy hog BT, IN, NE
Tapirus indicus - Malayan tapir BU, ID, MA, TH
Thylacine cynocephalus - Thylacine AU
Tokudaia osimensis muenniki - Ryukyu spiny rat JP
Ursus maritimus - Polar bear UR
Viverra megaspila civettina - Malabar large-spotted civet IN
Wyulda squamicaudata - Scaly-tailed possum AU
Zaglossus bruijni - Long-beaked echidna NG
Zalophus californianus japonicus - Japanese sea lion KO, JP

ORANG-UTANS

In **Tigerpaper** *III:4 we ran an excerpt of an article on "Hunting Pressure on Orang-utan in Sarawak." We have since received additional information concerning the continued hunting pressure on orang-utans in Sarawak from Bruce E. Weber, who, along with his wife, undertook a 1974 survey for the World Wildlife Fund, investigating the status of orang-utan in the Ulu Batang Ai region of Sarawak near the Indonesian border.*

Orang utan (Harrisson)

Orang-utan is well known to the peoples in the Ulu Batang Ai river system. From conversations with longhouse residents, observations of nests and other indications, it was concluded that this endangered species is relatively abundant around the headwaters of the Ai, Engkari and Lubong Baya Rivers, as well as in the nearby mountains separating Indonesia from Sarawak.

Reports from Longhouse residents indicate that orang-utan and or their nests are sometimes seen in secondary forest and garden areas where they apparently seek out fruits and vegetables planted in conjunction with shifting rice cultivation. This fact is important because it suggests that orang-utan may be capable of occupying secondary forest sites that were once logged-over or cleared for agriculture. This observation is made at a time when some orang-utan specialists maintain that primary forest is absolutely essential for the survival of the species.

During an up-river journey a young orang-utan was confiscated at a rural long-house by an officer of the National Parks and Wildlife Division who was in the party. The orang-utan was being kept illegally. Upon being questioned the people of the village reported finding it "abandoned in the forest." But investigation revealed a different story. Skull, hair and other parts of orang-utan hung about the longhouse, principally used to construct ceremonial objects. After further questioning, the residents admitted to hunting and eating orang-utan, despite official legislation and the regional taboo among the Iban tribe against killing this animal.

Two days later, when making camp upriver, a deplorable sight was discovered aside an old campfire. It was the fingers, skull bone and long red hair of a mature orang-utan. Though there is no definite proof, it is likely that this represented all that was left of the young orang-utan's mother. It was rumored in the region that the villagers had been keeping the young orang-utan for about a week. Judging from the condition of the orang-utan remains discovered upstream, this was about the amount of time that had passed since the mature orang-utan was killed.

The lesson to be learned from this unusual incident is that it may not be all that "unusual". With further exploration more incidents like this will probably come to light, demonstrating that orang-utan are regularly hunted by some people in spite of being a protected species in Sarawak. The solution to the problem is not only to establish large reserves and to study the species' needs, but also to study the needs of the native people and to secure their help in carrying out an effective information campaign. Without the outright support of all the people, no species is safe, no heritage is secure. The Government of Sarawak has made much progress through legislation, reservation and especially education to save orang-utans from extinction. However, there are still people in the wilderness who need to be made aware of the urgent necessity for the protection of the orang-utan.

Bruce E. Weber
(formerly IUCN Project Officer)
U.S. Dept. of the Interior
National Park Service
Gateway National Recreation Area
Staten Island Unit
P.O. Box 37
Staten Island, New York 10306

BLACK PARTRIDGE PROTECTED

In **Tigerpaper** III:4 we published an article on "Vanishing Birds in India". It was stated concerning the Black partridge *(Francolinus francolinus)* that "the Haryana Government put a one year ban on its shooting in 1972, but what they overlooked was that the birds were not shot but snared." We have since received a letter from the Chief Wildlife Warden, Haryana, Chandigarh, stating that this information is incorrect. Not just shooting, but all hunting (which includes snaring under the Wildlife Protection Act, 1972) of this bird has been completely banned since the adoption of the Black partridge as a State bird. He also informs us that the national bird, peafowl *(Povo cristatus)* is safe throughout a major portion of the Haryana State where the hunting of this bird is restricted not only under game laws but also due to religious sentiments.

PUBLICATIONS

WILDLIFE UTILIZATION AND GAME RANCHING

by Sue Lee Mossman and Archie S. Mossman
IUCN Occasional Paper No. 17, 98 pp. US$4.00

During 1974-75 Sue Lee and Archie S. Mossman revisited game ranching areas in Rhodesia where Archie Mossman had previously pioneered in game ranching during 1959-1963. Their studies were extended to include other areas in Botswana, Swaziland and the Republic of South Africa in order to permit a review of progress in game ranching during this 15-year period. The result is a most useful compilation of information on wildlife utilization which should prove valuable throughout Africa as well as in other parts of the world.

Although it would not be accurate to state that game ranching has thrived in Southern Africa since its beginnings, it has been a reasonably successful endeavour. It has succeeded despite misunderstanding, lack of adequate information, lack of any real government support and considerable opposition. The difficulties that the Mossmans encountered in their attempts to evaluate progress reflect the apathy or confusion of those departments charged with wildlife management. The remarkable financial success of some game ranching enterprises under these unfavourable circumstances gives some clue to what the success could have been with proper support.

This publication should be useful not only to those who have an interest in the evaluation of game ranching, but also to those who wish to start such an enterprise. Most particularly it should be read by all who are concerned with increasing animal protein supplies for the people of the world.

Ray Dasmann
from **IUCN Bulletin,** *January 1977*

ECOLOGY AND CONSERVATION IN PAPUA NEW GUINEA

Wau Ecology Institute, Papua New Guinea
Pamphlet No. 2 1976
Edited by K.P. Lamb and J.L. Gressitt

Ecology and Conservation in Papua New Guinea is a compilation of papers presented at a symposium held at the Wau Ecology Institute on 4 November 1975. A wide range of subjects are discussed in an "attempt to encourage interdisciplinary interaction and to foster the spread of available information."

The various papers deal with conservation and ecological measures pertinent to Papua New Guinea and the surrounding region with the hope that through the exchange of this information, developing countries can better plan their development and economic programs with an eye to potential ecological pitfalls.

One paper discusses the need for national parks and reserves which take into account the particular requirements and land status of the country, while others study potential food resources from plants and the feasibility of establishing coral reef fisheries. A national wildlife programme for Papua New Guinea is outlined and an extensive description of production forestry and its impact on forest resources is given.

Wildlife conservation subjects include an examination of the problems involved in making ecological studies and formulating conservation measures when little is known about unique fauna due to difficulties in observing the animals in their native habitat.

Methods of biological control of pests are offered as ways of decreasing the use of insecticides. One interesting and informative paper entitled "Ecology and Insect Pests" offers evidence to support the use of cultural control to reduce crop damage by insects.

Copies of Ecology and Conservation in Papua New Guinea can be obtained by writing to J.L. Gressitt at the Wau Ecology Institute P.O. Box 77, Wau, Papua New Guinea. The cost is US$2.00 which includes surface postage.

MARINE TURTLE NEWSLETTER

Efforts are going on all over the world to save turtles from extinction, but the efforts are scattered and insufficiently co-ordinated. IUCN's marine turtle group is therefore now publishing an occasional newsletter to provide a forum for exchange of information and to give warning of particular threats as they arise.

Those wishing to receive this newsletter should write to: Dr. N. Mrosovsky, Department of Zoology, University of Toronto, Toronto M5S, Canada.

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NEWS FROM WWF/IUCN

THE PRIZE AND THE PERIL IN SOUTH EAST ASIA

It would be hard to exaggerate the importance of tropical rain forest or the degree of threat facing them. Especially is this true of the lowland rain forests in the Far East. Outstandingly rich in both plants and animals, they will hardly exist in 10 years' time at the present rate of felling.

All other considerations apart, the rain forests represent a vast (if dwindling) store-house of genetic capital, built up over millions of years and as yet almost wholly untapped. From the beggarly amount of research done to date have come improved crops and new drugs. Agriculture, medicine and many other sciences will in the years to come be hugely indebted to these forests and the life they nourish. Always assuming they are still there.

In the accountancy of most countries of the world, deferred benefits, however substantial, count for little when weighed against quick returns. The developed world has small excuse. But South East Asia is not the developed world. Who will chiefly gain from the deferred benefits? Not those to whom the forests belong and from whom conservation requires restraint. The chief gainers will be the peoples of more affluent lands with large research budgets and skills to match.

In any case, with their populations and their people's expectations both rising fast, South East Asian countries might seem to be in no position to reject quick returns. All the same it makes no economic sense to convert a remarkably rich renewable resource into a non-renewable one through excessive harvesting. Especially when the profit to the "seller" is as nothing to that of the "buyer" - the importing nation and its manufacturing industries.

The moral is plain. South East Asia must work towards a greater - and a lasting - share of the wealth of its own forests. While protected forest must be sacrosanct, "managed forest" should be appropriately developed in line with the needs of home-based industry. There is no necessary conflict between conservation and development. Indeed a marriage or at least a close working relationship is long overdue.

In 1974 IUCN played a leading part in a regional conference designed to produce ecological guidelines for development in tropical forest areas of South East Asia. With financial support from UNEP and the WWF, and in close collaboration with FAO and UNESCO, IUCN has now produced an action programme for the whole of South East Asia, mapping out the needs for nature conservation in the region as a contribution to balanced development. Speedy action is called for. A large number of projects have been specified and already in Indonesia 17 of them have received Government backing, while WWF has pledged support to the tune of $1.2 million.

So far so good. Funding must now be found for the many projects of equal urgency elsewhere in the region. It should be looked upon as a solid investment in the future wellbeing of Man.

ACTION PLAN FOR SOUTHEAST ASIA

The following report consists of an action plan for each country. Each action plan consists of projects or action priorities. A project is an activity for which full details are available on the cost, the time-table and the means of carrying it out. An action priority is a brief statement of a conservation problem and the action recommended. Its cost, where given, is an estimate only.

Sub-programme 1: BURMA

1.1. Survey of the population status of important species of animals

Extending from the Himalayan region with its part palearctic fauna in the north to the Kra Isthmus with its Malayan type fauna in the south, and from the borders of China in the east to India in the west, Burma has an exceptionally rich variety of habitats containing a long list of indigenous animals. Unfortunately, very little is known about the present status of most of these animals, many of which are suspected of being either endangered or near to extinction. In order that conservation measures can be undertaken to protect these species, surveys of their population status are needed.

1.1.1. Survey of the population status of the mammals.

Of the long list of mammals found in the country, the following need to be surveyed: Asiatic wild dog, red panda, clouded leopard, tiger, Asiatic elephant, Malayan tapir, Sumatran rhinoceros, Javan rhinoceros, musk deer, Fea's muntjac, Asian Buffalo, gaur. The survey should look into not only the population status of these species, but also the state of their habitat.

Action priority. Cost: $30,000

1.1.2. Survey of the population status of bird species.

Because of its proximity to the eastern Hima-

layan region, Burma has inherited a good collection of pheasant species on its mountains. The most important include Blyth's tragopan, Temminck's tragopan, Sclater's monal, Lady Amherst's pheasant and the bar-tailed pheasant. Here too a survey is needed to determine their population status and the state of their habitat.

Action priority. Cost : $20,000

1.2. Survey of existing and proposed reserves

There are 13 game sanctuaries of which 11 are listed in the World Directory of National Parks (1975) and 2 have been created since 1974. A further 12 sanctuaries have been proposed and have been under consideration for some years. These are in need of surveys.

1.2.1. Survey of existing game sanctuaries.

The present existing game sanctuaries (13) are: Pidaung, Schwezettaw, Shwe-u-Daung, Minwun, Kahilu, Mulayit, Maymyo, Moscos Islands, Kelatha Hills, Taunggyi, Diamand Islands, Kyauk-Pan-Daung and Tamanthi. Together these amount to about 460,000 ha of wilderness ranging in altitude from sea level to about 1700m. A survey is needed to determine the extent of damage the sanctuaries have suffered, the population status of the mammalian and bird life, the degree of human encroachment, and to recommend measures to protect the sanctuaries.

Action priority. Cost $30,000

1.2.2. Survey of proposed sanctuaries.

The following 12 areas have been proposed as game sanctuaries: Rith Lake, Zamunt, Lemro, Watthigan, Thitson, Byingye, Peikthanoe, Ngwedaung, Yegouk, Htu Lake, Sehta-Thonga-Yona and Kyatthin.

These need to be surveyed to ensure that they can fulfil their function. The survey will also determine the boundaries, including recommendations for management plans and legislation.

Action priority. Cost: $35,000

1.3. Training of professional personnel.

The Forestry Department, which administers the sanctuaries, is in great need of professional officers trained in wildlife management and administration. A Game Warden is needed to lead a team of at least four or five well-trained wildlife staff. As no advanced training facilities exist in the country, it would be necessary for these officers to receive training overseas.

Action priority.

Sub-programme 2: THAILAND

2.1. Protection of endangered mammals.

Of the endangered mammals, the tiger, the kouprey and the pileated gibbon require immediate conservation action.

2.1.1. Operation Tiger: **Khao Yai National Park.**

The Khao Yai National Park is rich in wildlife, particularly the tiger's prey species such as the wild boar, the barking deer, sambar, gaur and banteng. Thus it has excellent habitat for the tiger to survive. It also has good habitats for the pileated gibbon. The basic plan is to provide better management and protection of the park so that poaching and habitat destruction can be reduced to a minimum if not entirely prevented.

Project 1019. Cost: $100,000

2.1.2. Operation Tiger: strengthening of guard system in game reserves.

The tiger is also found in three wildlife sanctuaries: Huay Kha Khaeng, Tung Yai and Salak Pra, which are situated close to each other and centred around the Kwae Yai river. These areas are now being encroached upon and the threat to the wildlife, particularly the tiger, is serious. This project aims at improving the guard system in the sanctuaries by the provision of equipment needed for controlling the areas.

Project 1020. Cost: $110,000

2.1.3. Kouprey sanctuary.

The kouprey is a highly endangered species. A recent expedition to its habitat failed to find the species: its absence being attributed to human encroachment upon its habitat and poaching. It is highly desirable that an effectively protected sanctuary be established in the Dangrak Range where the habitat is suitable for the species' survival.

Action priority. Cost: $30,000

2.2. Improvements to conservation areas.

Though the existing parks and reserves do provide a fairly good co erage of the diverse ecosystem, improvements need to be made to enhance

A root parasite (Balanophora latesepala) at Khao Soi Daow (Damman).

their usefulness and effective protection. The following are set out with this objective in view.

2.2.1. Coordination of reserves in Korat Plateau.

The parks and reserves on the Petchabun Range constitute a group of very valuable faunal regions. They are separated from each other by narrow stretches of forested country. It would be highly desirable to join them together into one large protected area.

Action priority.

2.2.2. Survey to identify more forest types for conservation.

A survey is needed to see whether the following forest types are adequately represented in conserved areas: (1) dry dipterocarp forest on the Korat Plateau; (2) lowland rain forest in the Chantaburi district of the South East Highlands; (3) lowland rain forests in the Southern Peninsula; and (4) limestone forests in the Southern Peninsula.

Action priority.

2.2.3. Khao Soi Daow Sanctuary.

The sanctuary contains one of the most important watersheds in this part of the country as well as excellent habitat for such important animals as the tiger, gaur, banteng, Javan rhinoceros, clouded leopard and gibbons. The ecosystem is seriously threatened by shifting cultivators and its wildlife is rapidly being depleted by poachers and firewood gatherers. The project aims to provide an intensive protection for the sanctuary by a system of guard houses, and effective control by means of motorized vehicles. Provision is also made for the training of rangers.

Project 1205. Cost: $25,000

Sub-programme 3: KHMER REPUBLIC

Not much is known about the present situation. But obviously conservation along with so much else has suffered greatly from the ravages of war. Conservation plans must effectively start from scratch.

The only park is the Angkor National Park. Its chief purpose is to protect the famous Angkor Wat ruins. Little is known about the state of the five fauna reserves.

3.1. Survey of population status of endangered species.

Of the animals in the Khmer Republic, the kouprey, the douc langur and the pileated gibbon appear to be in danger of extinction. A country-wide survey on their status is urgently needed.

Action priority. Cost: $20,000

3.2. Survey and consolidation of existing protected areas.

The six existing reserves are Angkor Wat, Koulen Promtep, Phnom-Prich, Lomphat, Kirikom and Phnom Kravanh. It is not known how well established and effectively protected these conservation areas are. A comprehensive survey is required on the following aspects: boundary demarcation, staff requirements, inventories of the fauna and flora, detailed management plans and legislation proposals.

Action priority. Cost: $40,000

3.3. Establishment of new protected areas

Six additional areas have been identified as worthy of protection as reserves. These are: (1) The

Elephant Mountains, (2) The Cardamon Mountains, (3) The Great Lake, (4) Senmonorum, (5) The Hodrai-Sou and (6) The Dangrek Range.

Ecosystems included in these areas range from humid evergreen forests to monsoonal and swamp forests. The habitat of the kouprey, the rhinoceros, pileated gibbons and a lot of other mammals and birds will be included. A survey is needed to demarcate their boundaries and propose management plans and legislation for their inclusion in a network of reserves.

Action priority. Cost: $40,000

Sub-programme 4: LAOS

Protective legislation largely dates from the French colonial period. No proper conservation areas or wildlife reserves exist even on paper. An FAO project for a national park in an area where tiger and elephant still survive is now uncertain since the advent of the Pathet Lao government - December 1975. However this government is perhaps the first to show some concern for conservation. "Rational exploitation" of forests is one of eight proposed policies.

4.1. Establishment of new protected areas.

As far as can be determined, no forest reserves or wildlife conservation areas now exist. A complete new system of protected areas is required. The following have been identified as possible sites:

Phou Khoa Khuay - part of an 800 m high plateau where the elephant and tiger are known to exist and which is suitable as a national park; Hodrai-Sou - part of a natural area shared with the Khmer Republic and Vietnam; Bolovens Plateau - an important watershed with large tracts of undisturbed rain forests; Tchepone - limestone mountains; Xieng Khouang - with very diverse vegetation; Nam Ou and Luang Prabang - highland monsoon and rain forest with hunter-gatherer tribes; Phong Saly and the Upper Mekong - two areas with Chinese faunistic elements.

Action priority.

Sub-programme 5: VIETNAM

5.1. Survey of existing reserves.

Prior to the unification of Vietnam in 1975, four reserves were designated for protection two of which were considered to be worthy of recognition as national parks. These reserves are: Trang-Bom and Bach-Ma-Hai-Van, both of national park rank and the four game reserves: Krong Poko, Bantum, Kinda and Langbian. As nothing is known of the status of these areas, a survey of the wildlife and the ecosystems is needed.

Action priority.

5.2. Survey of proposed areas.

Eight other sites have been reported to be worthy of consideration as new protected areas. These are: Hao Son-Dai Lanh (a scenic area on the coast 50 km north of Nhatrang), Bao Loc (forested area south of Blao), Doc Xuyen (Banmethout region), Canh Duong and O Loan (on the coast), Langbian plateau (important watershed in Darlac Province), Hodrai Sou (Annamite Chain shared with Khmer Republic and Laos) and Bac Lieu (Mekong Delta). A survey is needed to determine their suitability as either national parks or game reserves.

Action priority.

Sub-programme 6: MALAYSIA

6.1. Peninsular Malaysia action plan.

Because this is a large country, existing protected areas are too few to serve its needs. Additional areas need to be selected for inclusion in a network of reserves. The following are planned to achieve this objective.

6.1.1. Establishment of new protected areas.

The following have been identified as possible areas for national parks or nature reserves: (1) Endau-Rompin area covering the States of Johore and Pahang. A large population of the Sumatran rhinoceros is reported to be present; (2) Tasek Bera in Pahang, a swamp area with important animals like tiger, tapir, gibbons and other small mammals; (3) Sungei Nenggiri in Kelantan, also with tiger, tapir, leopard, siamang and banded leaf gibbon; (4) Grik in Perak, another area with tiger, seladang, tapir; (5) Belum in Ulu Perak, another wildlife-rich area; (6) Ulu Muda, an important catchment area on the Thailand border; (7) Telok Peat Swamp in Selangor which has potential as a botanical educational area and (8) G. Panti in south Johore which has a unique flora.

Action priority.

6.1.2. Tiger Reserve.

A tiger reserve is needed in view of the steady decline of the species throughout its range. Trengganu is the best State in which to establish the sanctuary because of the relatively high tiger population there.

Action priority.

6.1.3. Krau Game Reserve.

This reserve is complementary to Taman Negara in that Gunung Benam is granitic and not sedimentary. It is thus likely to have a flora and fauna different from those in Taman Negara. Though protected, it has no management plan. The project is designed to achieve this objective.

Project 1177. Cost: $15,000

6.1.4. Provision of an education unit.

At present there is little available information on Malaysian natural history and environment. Hardly any literature on the natural heritage exists in the national language. There is also a serious lack of suitable teaching aids for the formal education system in the country. This project makes provision for the employment of an education officer to visit schools, youth clubs, etc. to give talks (in English

and also the national language) on a range of subjects. This project will be developed in co-operation with the Ministry of Education.

Project 1530. Cost:$5,000

6.2.1. Survey of the fauna in Sabah.

The fauna of this country has never been properly surveyed. A survey of the more important fauna is therefore long overdue. This investigation should cover the following species: orang utan, Sumatran rhinoceros, banteng, maroon leaf monkey, Muller's gibbon, Hose's palm civet.

Action priority. Cost: $30,000

6.3. Surveys of existing and proposed protected areas.

All the existing and proposed national parks and proposed wildlife sanctuaries are in need of surveys. Areas with good stands of mangrove should be sought for conservation.

6.3.1. Survey of existing national parks.

The existing national parks are: (1) Bako: an area containing small samples of a wide range of forest types including habitat of the proboscis monkey; (2) Niah: this covers the limestone ridge of Bukit Subis and a sizeable swamp forest including archeological sites in the caves; (3) Gunung Mulu: a 528 sq km area containing samples of a very wide range of forest types and their associated wildlife; and (4) Lambir Hills: a small area with still many small mammals and birds. These are in need of detailed management plans (especially Gunung Mulu) including an inventory of the more important plant and animal life.

Action priority. Cost: $50,000

6.3.2. Survey of proposed national parks.

The following five areas have been proposed as new national parks: (1) Pelagus, (2) Matang, (3) Gunung Gading, (4) Simalajan, and (5) Loagan Bunut. A survey is needed to assess the population status of the more prominent fauna, to determine their adequacy as protected areas and also to demarcate their boundaries.

Action priority.

6.3.3. Survey of proposed wildlife sanctuaries.

The three areas proposed for wildlife sanctuaries are: (1) Ulu Batang Ai-Lanjak Entimau: a large area suspected to contain the last big population of orang utan in Sarawak, (2) Gunung Pueh: a botanically rich area with equally rich mammalian life, and (3) Turtle Islands: an area where the once flourishing green turtle may have a chance to survive. The survey should assess the suitability of these areas as wildlife sanctuaries.

Action priority.

6.3.4. Establishment of a mangrove reserve.

An area covering more extensive stands of mangrove forest than are found in the Bako National Park is desirable. The area should contain a viable population of the proboscis monkey.

Action priority.

Sub-programme 7: BRUNEI

7.1. Establishment of a system of reserves.

Because the greater part of Brunei's forests and their dependent wildlife seem safe for the foreseeable future, the country is in an excellent position to establish a model system of reserves. Two areas are available for this purpose: Bukit Peradayan and Ulu Temburong. The former is a small sandstone plateau bearing health forests with rain forests on the scarps and the latter has lowland and montane evergreen rain forests.

Action priority.

7.2. Survey of the more important fauna.

A faunal survey is necessary to identify additional areas of forest for protection. The survey should investigate not only animals such as the orang utan, rhinoceros, clouded leopard and proboscis monkey, but also important bird species like the hornbills.

Action priority.

Limestone pinnacles at Gunung Mulu (Andersen).

Sub-programme 8: INDONESIA

8.1. Sumatra action plan.

A great majority of the long list of reserves in this large island are in need of attention as they have suffered various degrees of degradation. Because the list is long, the following have been selected for urgent attention.

8.1.1. Gunung Leuser.

This complex of reserves constitutes perhaps the most important area in Sumatra. It is one of the last strongholds of the seriously endangered Sumatran rhinoceros, orang utan, Sumatran tiger, clouded leopard and many other species. This area suffers

from encroachment and poaching. The project aims to provide a comprehensive management plan.

Project 1514. Cost: $200,000

8.1.2. **Berbak Reserve.**

This reserve of 1800 sq km on the east coast of Sumatra still has substantial tracts of primary rain forests with important animals like tapir, tiger, elephant and Sumatran rhinoceros. The area is coming under increasing pressure from human settlement. This project has the objective of establishing effective management, including an extension westward of the present boundaries to include more of the higher ground.

Project 1515. Cost: $25,000

8.1.3. **Tiger Reserve in Central Sumatra.**

The Sumatran tiger is seriously threatened in spite of protective legislation: it is estimated that at most 300 are left. These are being hunted and killed at an alarming rate. This project aims to establish a large reserve where there is a good tiger population with a good supply of prey species. The proposed location is a 5000 sq km concession area of Caltex Pacific Indonesia on the east coast of Central Sumatra. This project provides for a detailed survey of the area as a basis for the foundation of a management plan.

8.1.4. **Primate Reserve: Siberut Island.**

The Mentawai Islands, west of Sumatra, have four primate species endemic to the archipelago. The survival of the species is seriously threatened by the loss of their habitats, through logging and shifting cultivation. The situation, however, is less serious on Siberut Island. This project aims to establish a reserve on this island which has perhaps the best habitats for these primates.

Project 1517. Cost: $75,000

8.1.5. **Sumatran rhinoceros: establishment of breeding centres.**

The Sumatran rhinoceros is now confined to the Gunung Leuser Reserve in Sumatra and the Endau Rompin area in Peninsular Malaysia. Current conservation efforts are being directed towards the protection of its habitat and the prevention of poaching. In addition to these, a captive breeding project is needed to boost the critically low population. This project will involve the establishment of two units: one at the site of capture to acclimatize the animals and the other at a zoo outside the area of capture.

Project 1533. Cost: $60,000

8.2. **Java action plan.**

This island still has a long list of reserves in spite of the fact that it is the most densely populated in South East Asia. However only a few are of exceptional importance, such as Ujong Kulon, Meru Betiri, Cibodas, Bawean Island and Gunung Tilu. And these have either suffered various degrees of degradation or are in need of additional support to enhance their effectiveness as conservation areas.

8.2.1. **Ujong Kulon: management plan.**

This reserve is the last remaining habitat of the Javan rhinoceros and is the best functioning one in Indonesia. The management and protection programme, initiated some years ago, needs to be continued into future years. This project also aims to provide support for the gathering of scientific data needed to improve the effective management of the reserve.

Project 1518. Cost: $100,000

Meru Betiri (Hoogerwerf).

8.2.2. **Meru Betiri Tiger Reserve.**

This is the last refuge of the Javan tiger. Effective protection and management of the reserve must be implemented according to the management plan under IUCN/WWF Project 1015. This project aims to have the recommended measures implemented, including an extension of the reserve to cover some lowland country containing the tiger's prey species.

Project 1024. Cost: $40,000

8.2.3. **Cibodas Reserve.**

The oldest reserve, the Cibodas lies between the altitudes of 1450 and 3000 metres. This area has a long history of research and consequently has good facilities for field studies. The reserve is the last refuge of a number of montane plants and animals. Protection and control of the area are in urgent need of improvement. Tourism needs to be regulated and an education programme for visitors is required.

Project 1521. Cost: $20,000

8.2.4. **Gunung Tilu Reserve.**

The Gunung Tilu complex is an attractive mountain area of relatively undisturbed primary highland rain forest, the main part of which lies between the altitudes of 1200 and 2000 metres. Surrounded by tea plantations and settlements, the reserve is now coming under great pressure from shifting cultivation, timber extraction and poaching. The project will support the establishment of the area as a reserve and the elaboration of a management plan. Project 1520. Cost: $20,000

8.2.5. **Kuhl's Deer: Bawean Island.**

A Red Data Book species, the Kuhl's deer is now confined to Bawean Island where its population size is estimated to be about 500. The species is declining in numbers through loss of habitat and hunting. The project provides support for an ecological investigation which will form the basis for an effective management programme.

Project 1522. Cost: $15,000

8.3. **Kalimantan action plan.**

The three most important areas in Kalimantan are: Tanjong Puting, Kutai and Bukit Raya. The following projects are designed to increase their usefulness as conservation areas.

8.3.1. **Tanjong Puting.**

This large lowland reserve covers 2000 sq km of lowland rain forest and peat swamps. It has important habitats for the orang utan, proboscis monkey and other primates. It has potential for controlled tourism and could be developed as a national park. The project aims to improve its management and to add an extension to the east to cover mangrove swamps. Project 1523. Cost: $30,000

8.3.2. **Kutai Reserve.**

This reserve is one of the few remaining areas of relatively undisturbed lowland rain forest in Kalimantan. It has a good orang utan population and is expected to have some rhinos. The area is under great pressure from settlement and logging. This project will support both a survey to redefine its boundaries and the subsequent formulation of a management plan. Project 1524. Cost: $45,000

8.3.3. **Bukit Raya.**

This montane reserve has never had any effective control. This project aims to support a survey to project aims to support a survey to demarcate its boundaries; a guard system and a management plan are also required.

Project 1525. Cost: $50,000

8.4. **Sulawesi action plan.**

Of some six reserves in this archipelago, Lore Kalimanta and Tangkoko-Batuangus are the two most important. They are in need of conservation support.

8.4.1. **Lore Kalimanta.**

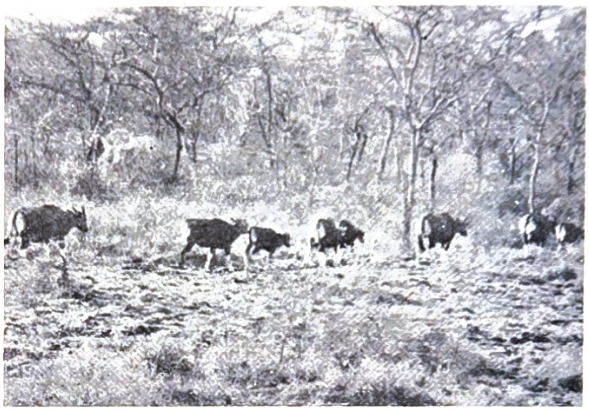
This highland reserve has a diversity of undisturbed primary forest types. Surrounded on three sides by settlement, it is rapidly being encroached upon. This project aims to support a survey of the boundaries and the formulation of a management plan.

Project 1526. Cost: $75,000

8.4.2. **Tangkoko-Batuangus.**

Although small and partially logged, this reserve still contains some good primary forest with a rich fauna. The reserve lacks management and is consequently unprotected. The project supports a survey to elaborate a management plan.

Project 1527. Cost: $50,000



Banteng at Baluran Reserve (Hoogerwerf).

8.5. **Irian Jaya action plan.**

Comprising half the island of New Guinea, Irian Jaya harbours a very rich and diversified fauna and flora with a very high percentage of endemism. 75% of Irian Jaya's total area of some 422,000 sq km is still under primary forest. Yet this vast area has but one reserve, the Lorentz reserve. Most of the lowland forests have now been surveyed for timber extraction, oil exploration and copper mining. In view of these development plans, it is urgent that a system of reserves be established to protect as great a range of vegetation types as possible. The following have been identified as potential sites: (1) North Coast, an area of almost 50,000 ha in the Sg. Tor-Sg. Bier district extending from the coast through mangroves, fresh-water swamps, and lowland rain forests to slightly drier lower montane rain forests with *Agathis;* (2) South East Coast, an area of 800,000 ha from Teluk Koperapok northwards to include the Naussau ranges up to Mt Carstenz with glaciers and permanent snow; (3) Manokwari Peninsula, an area in the southern scarp of Arfak mountains; (4) Cycloops Mountains, a coastal range from the coastline to over 2500 metres in altitude; and (5) West Coast, possibly an area near Fak Fak. This project supports a survey of these areas to assess their potential as national parks and reserves.

Project 1528. Cost: $100,000

8.6. **Indonesia-wide projects.**

In order that these 16 Indonesian projects can have lasting impact, two other supporting projects, Indonesia-wide in application, are required. These are the Education Project and the Project to Co-ordinate Conservation Action in Indonesia.

8.6.1. Conservation Education.

The long-term success of conservation programmes depends largely on the support of the local people. Education at all levels is therefore one of the most important and efficient tools to ensure a lasting effect of any conservation activity. This project is to assist the Indonesian authorities to elaborate a strategy for conservation education in Indonesia.

Project 1513. Cost: $70,000

8.6.2. Co-ordination of Indonesian Conservation Programme.

The entire conservation programme for Indonesia requires participation by both national and international organizations, and close co-ordination at all levels is essential for its efficient implementation. This project supports the employment of an IUCN/WWF representative to act as a liaison officer between the Indonesian authorities and the IUCN/WWF Headquarters and also to administer and co-ordinate the implementation of the projects in Indonesia. This officer will work closely with an Indonesian co-administrator to be nominated by the Indonesian Directorate of Nature Conservation.

Project 1512. Cost: $100,000

8.7. Study of human geography of rural populations.

In many parts of Indonesia, rural populations pose a serious threat to their adjacent protected natural areas. These threats take the form of firewood collecting and encroachment in search of arable land. In order that such pressures on protected areas can be alleviated, the needs of the rural people must be catered for in some alternative way.

8.7.1. Survey of firewood needs of rural populations.

In many districts of Sumatra, Java and Kalimantan, firewood collecting by rural people from protected areas has reached serious proportions. To plan for their requirements, we need accurate information on their energy needs and sources of supply. It is proposed that a survey be carried out on representative populations to assess their energy requirements and to recommend ways in which this need can be met without having to use the basic resources of protected areas. It is hoped that the strategy developed in these places will be of use to solve similar problems in other parts of South East Asia.

Action priority.

8.7.2. Socio-economic survey of the rural population.

Encroachment on natural areas comes largely from populations practising shifting cultivation, especially in Kalimantan. A survey of their requirements is urgently needed, with particular reference to land-use practices. It is also hoped that lessons learnt from this exercise will be of value to other parts of South East Asia. Action priority.

Sub-programme 9- PAPUA NEW GUINEA

9.1. Survey of existing protected areas.

The four existing areas are Variata National Park, McAdam National Park, Talele Islands Nature Reserve, and Baiyer River Wildlife and Bird-of-Paradise Sanctuary. A detailed survey needs to be carried out to ascertain their adequacy in conserving a good representation of the country's wildlife.

Action priority.

9.2. Establishment of additional areas for protection.

The existing reserves are clearly inadequate to cover even a minute representation of the very wide variation of vegetation types found in the country. An adequate network of new areas is needed to supplement these. Of the numerous sites proposed the following merit close attention: Mt. Bosavi in the Western Highlands, Mt. Giluwe in the Southern Highlands, Kerewo-Turama in the Gulf Province, and Bensbach River–Moorehead area in the Western Province. A survey of these areas is needed to determine their suitability as national parks or nature reserves with special reference to endemic species.

Action priority.

Sub-programme 10: PHILIPPINES

10.1. Survey of protected areas.

The 32 areas selected for inclusion in the four categories of protected areas have suffered various degrees of degradation through encroachment or neglect. Corrective measures to be taken on these include: (1) inventories of fauna and flora; (2) boundary demarcation; (3) preparation of management plans; (4) introduction of improved and suitable legislation; and (5) training of adequate staff to police and reserves.

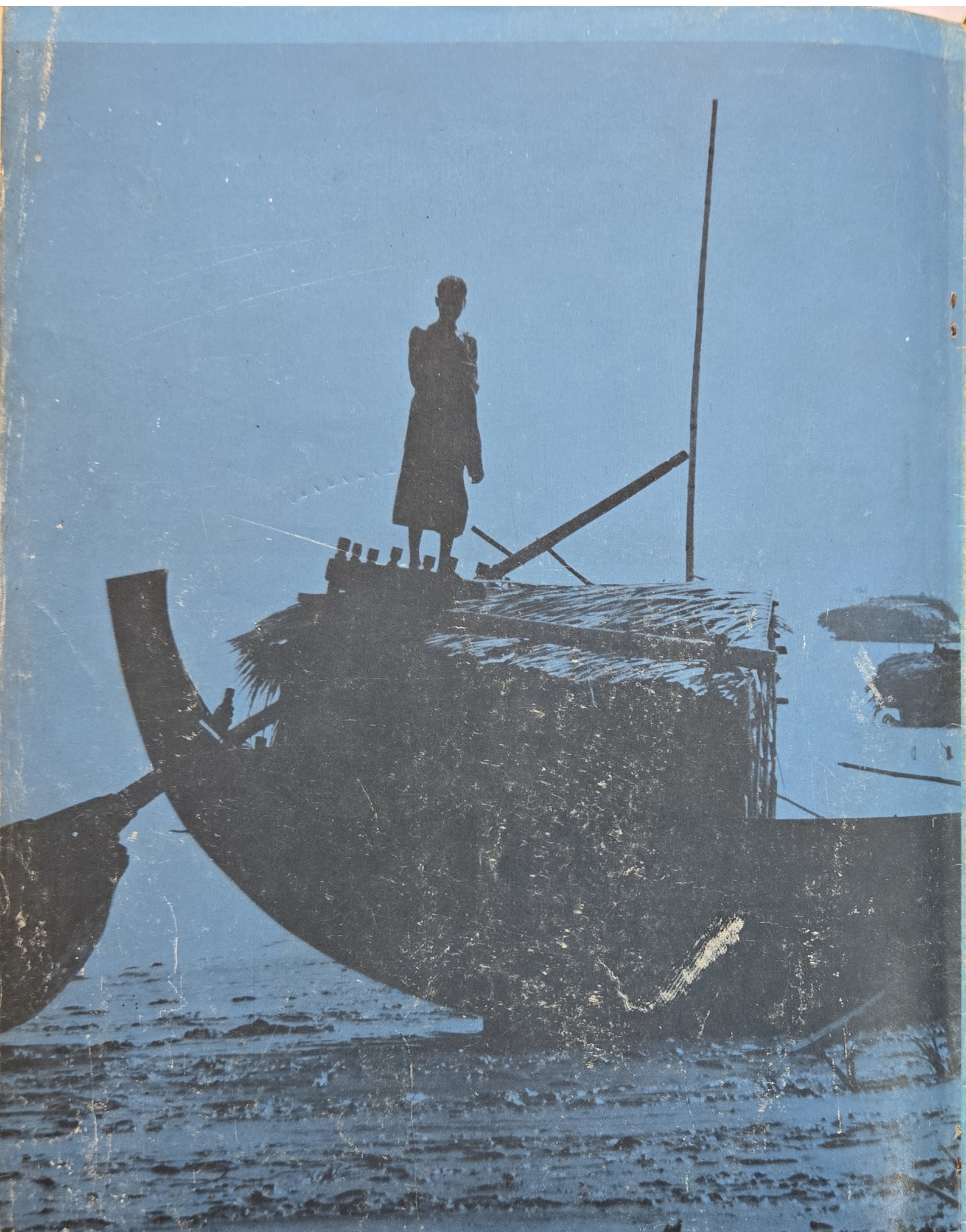
Action priority. Cost: $200,000

10.2. Monkey-eating eagle conservation programme.

This is one of the world's most endangered species of bird. Endemic to the Philippines, the species is now confined to Mindanao Island where its population is estimated to be no more than 50 pairs. Its endangered state is due mainly to over-collecting by trophy collectors and destruction of habitat by timber exploitation. Previous conservation campaigns have resulted in an increased level of understanding of the bird's plight, but greater efforts are needed to save its habitat.

Action priority. Cost: $25,000

from **IUCN Bulletin,** *January 1977.*



Erawan Printing
15-17 Phachathippatai Rd. Bangkok Thailand.
Tel. 282-0968, 282-2687
Samsen Rd. Banglumpoo Bangkok Thailand.
Tel. 281-7679, 282-0984, 282-0985